



CONTROL DATA®
FLEXIBLE DISK DRIVE
MODEL 9406-2/3

GENERAL DESCRIPTION
OPERATION
INSTALLATION AND CHECKOUT
THEORY OF OPERATION
DIAGRAMS
MAINTENANCE
MAINTENANCE AIDS
PARTS DATA
WIRE LISTS

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J	80 PF JAN 30	ii	B	A	A	A	J	B	A	G	A				PL 20370
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M	80 L.A. JUN 6	ii	K	K	M	K	M	K	A	H	K				PL 20427
N	80 SM JUN 13	ii	K	K	M	K	M	K	A	J	K				PL 20442
P	80 SW OCT 20	ii	K	K	M	K	M	P	A	K	K				PL 20482
R	80 SW DEC 11	ii	K	K	M	K	R	P	A	K	K				PL 20494
S	81 SW JAN 23	ii	S	K	M	K	R	P	A	K	K				PL 20504
T	81 SW FEB 21	ii, iii, v	S	K	M	T	T	T	A	L	K				PL 20513

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PREFACE

This manual provides the information needed to install, operate and maintain the Control Data Corporation Model 9406-2/3 Flexible Disk Drive (FDD) and is intended to support customer engineers who require detailed information about the Flexible Disk Drive's operation.

The total content of the manual is comprised of two publications, each having a unique publication number, and is contained in one volume. The Manual's publication number, 75897474, is that of the front matter, Sections One through Seven, and Section Nine. This number should be used when making reference to the Model 9406-2/3 Flexible Disk Drive Hardware Maintenance Manual.

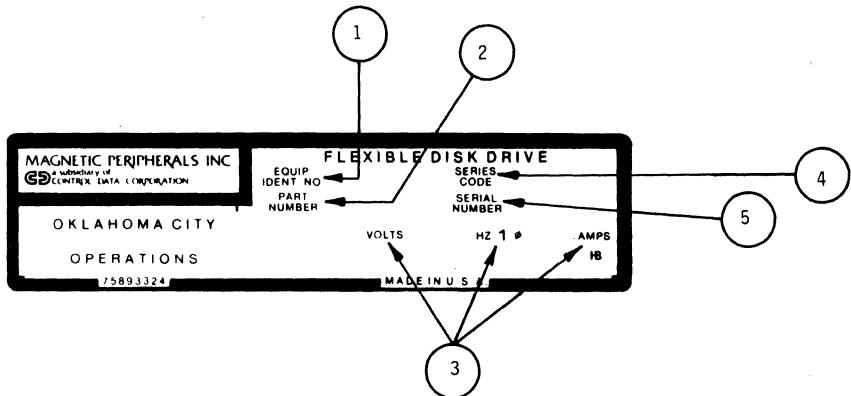
This manual applies to several models of the FDD. Refer to the equipment name-plate located on the right hand side of the unit (as viewed from the front) to determine the appropriate Hardware Product Configurator (HPC) and Equipment number.

Section VIII Parts Data is identified by the unique Publication number 75888344.

EMI NOTICE

NOTICE: This equipment has been designed as a component to high standards of design and construction. The product, however, must depend on receiving adequate power and environment from its host equipment in order to obtain optimum operation and to comply with applicable industry and governmental regulations. Special attention must be given by the host manufacturers in the areas of safety, power distribution, grounding, shielding, audible noise control, and temperature regulation of the device to insure specified performance and compliance with all applicable regulations. This equipment is a component supplied without its final enclosure and therefore is not subject to standards imposed by FCC Rules for Electro-Magnetic Interference (EMI). Federal Docket 20780/FCC 80-148 Part 15.

FLEXIBLE DISK DRIVE CONFIGURATOR SHEET



- 1 EQUIPMENT IDENTIFICATION NO./ HARDWARE PRODUCT CONFIGURATOR (HPC)
- 2 NOT APPLICABLE
- 3 AC POWER REQUIRED (ON UNITS LABELED 50/60 HZ, CHECK CONFIGURATION OF SPINDLE-MOTOR PULLEY FOR FREQUENCY).
- 4 EQUIPMENT STATUS NUMBER
- 5 UNIT SERIAL NUMBER

(2204a)

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1.1 INTRODUCTION

The Model 9406-2/3 Flexible-Disk Drive (FDD) is a compact, portable, random-access, data-storage device that interfaces with a central processor via a control unit. Input/Output data and control signals are transmitted by means of an I/O cable.

1.2 PURPOSE AND USE OF EQUIPMENT

Data, in the form of magnetized bits, is written on, or read from the tracks of a rotating diskette. The FDD uses a single, flexible, removable diskette enclosed in a sealed jacket. The unit is capable of hard-sector or soft-sector operation.

1.3 PRODUCT DESCRIPTION

The major FDD components are the spindle, disk drive motor, read/write heads, stepping motor, track-indexing devices and printed-circuit board.

The options include Write Protect, Data/Clock Separation, Sector Separation, Unit Select, Ready, Door Lock.

1.3.1 PHYSICAL DESCRIPTION

The physical dimensions for the equipment are as follows:

	9406-3	9406-2
Height	4.62 inches (117.4 mm)	4.97 inches (126 mm)
Width	9.50 inches (241.3 mm)	8.78 inches (223 mm)
Depth	14.25 inches (362 mm)	14.24 inches (363 mm)
Weight	12 lbs. (5.44 kg)	12 lbs. (5.44 kg)

1.3.2 ELECTRICAL DESCRIPTION

The electrical specifications for the equipment are as follows:

- DC Power Source (Supplied by Host Equipment)
0.1A Max. when Deselected
+24 volts ($\pm 10\%$) @ 1.2A Typical when Seeking
+ 5 volts ($\pm 5\%$) @ 1.0A Typical
- AC Power Source - Refer to the FDD nameplate to determine AC power requirements.

1.3.3 PERFORMANCE CHARACTERISTICS

The equipment specifications for the FDD are as follows:

- ACCESSING TIME

Maximum Access Time	248 ms
Maximum One-Track Access Time	23 ms
Average Access Time	96 ms

- RECORDING

Mode			
Density (nominal)	<u>Double Frequency</u>	<u>MFM</u>	<u>Track</u>
Head 0	1836 BPI (72 BPmm)	3672 BPI (145 BPmm)	Outer
	3268 BPI (129 BPmm)	6536 BPI (257 BPmm)	Inner
Head 1	1879 BPI (74 BPmm)	3758 BPI (148 BPmm)	Outer
	3408 BPI (134 BPmm)	6816 BPI (268 BPmm)	Inner
Data Transfer Rate	249, 984 bits/sec	499, 968 bits/sec	
Bits/Byte	8	8	
Bits/Track	41, 664	83, 328	
Tracks/Surface	77	77	
Sectors	Format Determined	Format Determined	
• DATA CAPACITY			
Bytes/Track	5,208	10,416	
Bits/Track	41,664	83,328	
Bits/Surface	3,208,128	6,416,256	

● FLEXIBLE DISKETTE (Optional)	CDC 421 Single-Sided, Single-Density CDC 423 Single-Sided, Double-Density CDC 425 Double-Sided, Double-Density
Diskette Dimensions	8 x 8 inches (203.2 x 203.2 mm) (including jacket)
Useable Diskette Recording Surfaces	2
Diskette Surface Diameter	7.88 in. (200.1 mm)
Recording Radii (Nominal)	
Head 0	Track 76 2.0290 in. (51.5 mm) Inner Track 00 3.6123 in. (91.8 mm) Outer
Head 1	Track 76 1.9457 in. (49.4 mm) Inner Track 00 3.5290 in. (89.6 mm) Outer
Diskette Surface Coating	Magnetic Oxide
Diskette Velocity	360 r/min
● READ/WRITE HEADS	
Heads/Unit	2
Track Width	0.013 in. (0.33 mm)
Track Spacing	0.02083 in. (0.529 mm)
Erase to Read/Write Gap	0.036 in. (0.914 mm)

2.1 INTRODUCTION

The FDD is under direct control of the input/output and power sources. No special start-up procedure is required. Operation is fully automatic and requires no operator intervention during normal operation.

2.2 OPERATING INSTRUCTIONS

Verify that power and I/O cables are securely attached ~~before operation~~.

2.2.1 FLEXIBLE DISKETTE LOADING

- a. Apply AC/DC power to unit.
- b. Open FDD door.
- c. Remove diskette from storage envelope as shown in Figure 2-1.
- d. Be sure the Write-Protect slot in the jacket is open, as shown in Figure 2-1, if the diskette is to be write-protected.
- e. If a diskette with a Write-Protect slot is not utilizing the Write Protect, that is, it will be written on, the slot must be covered with a piece of tape which is opaque to infrared.
- f. Carefully slide diskette into FDD, as shown in Figure 2-1, until jacket is solidly against stops and sets the ejector mechanism.
- g. Carefully close unit door. Ensure that jacket is properly seated, spindle has engaged diskette, and door is closed and latched.
- h. Protect the empty envelope from liquids, dust, and metallic materials.

2.2.2 FLEXIBLE DISKETTE REMOVAL

- a. Open FDD door to stop diskette rotation and disengage spindle.
- b. Remove diskette from FDD and put it in its storage envelope.
- c. Close FDD door.

2.3 ERROR RECOVERY

The following paragraphs give information needed to recover from possible errors in equipment operation.

2.3.1 SEEK ERROR

Seek errors will rarely occur unless the stepping rate is exceeded. In the event of a seek error, recalibration of track location can be achieved by repetitive Step Out commands until a Track 00 signal is received.

2.3.2 WRITE ERROR

To guard against degradation from imperfections in the media, no more than four attempts to write a record should be used when read after write errors are encountered. In the event a record cannot be successfully written within four attempts, it is recommended that the sector or track be labeled defective and an alternate sector or track assigned. If more than two defective tracks are encountered, it is recommended that the diskette be replaced.

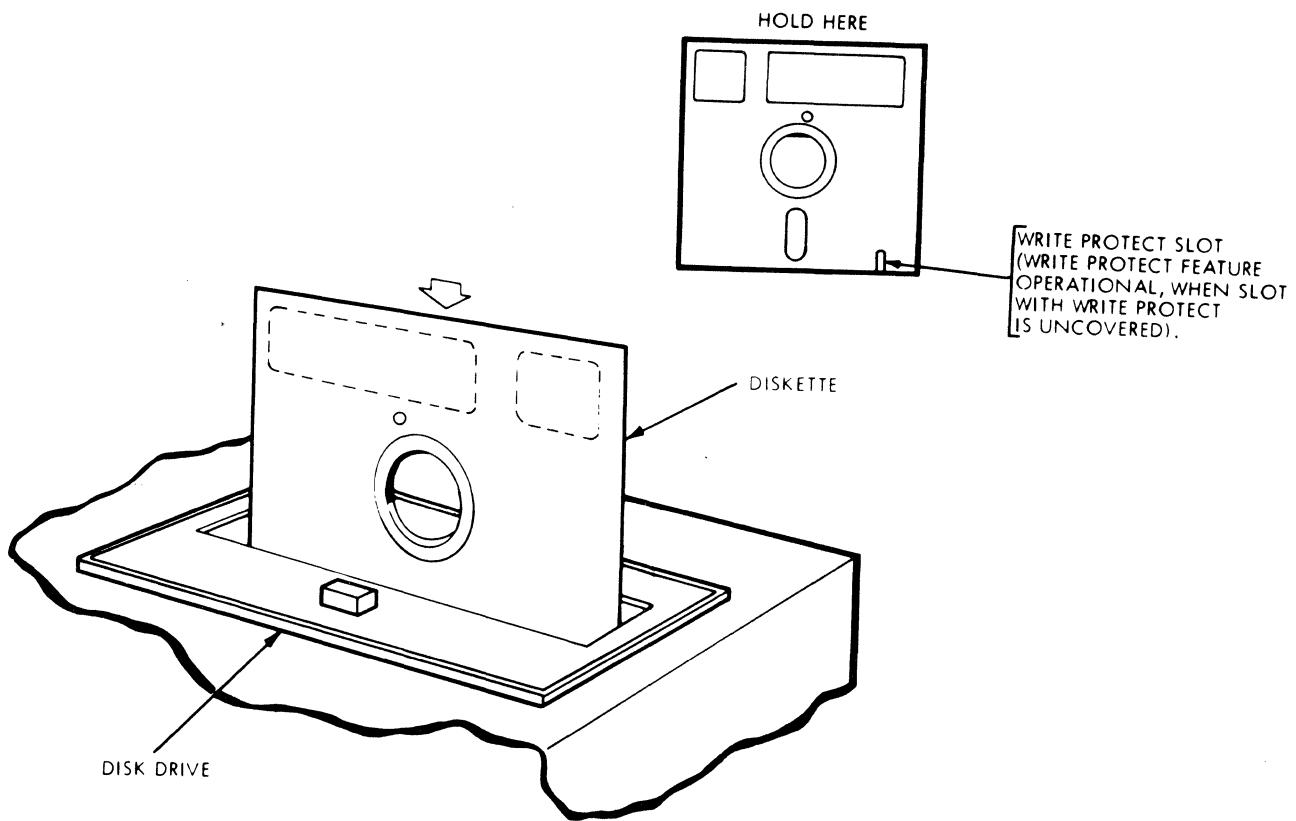


FIGURE 2-1. DISKETTE INSTALLATION

2.3.3 READ ERROR

In the event of a Read error, up to five attempts should be made to recover with re-reads. If after five attempts the data has not been recovered, retract the head to Track 00, reseek to the data track and attempt five additional rereads. Unloading the head when data transfers are not imminent will increase the data reliability and extend the diskette life.

2.4 DISKETTE HANDLING RECOMMENDATIONS

Since the recorded diskette contains vital information, reasonable care should be exercised in its handling. Longer diskette life and trouble free operation will result if the following recommendations are followed.

- Do not use a writing device which deposits flakes e.g., lead or grease pencils, when writing on diskette jacket label.

- b. Do not fasten paper clips to diskette jacket edges.
- c. Do not touch diskette surface exposed by jacket slot.
- d. Do not clean diskette in any manner.
- e. Keep diskette away from magnetic fields and from ferromagnetic materials that may be magnetized.
- f. Return diskette to envelope when removed from FDD.
- g. Protect diskette from liquids, dust, and metallic substances at all times.
- h. Do not exceed the following storage environmental conditions:

Temperature: 50° to 125°F (10° to 56.1°C)

Relative Humidity: 8% to 80%

Maximum Wet Bulb: 85°F (29.4°C)

- i. Diskettes should be stored in a box or cabinet when not in use.
- j. Remove diskette before applying or removing power to the FDD.

3.1 INTRODUCTION

This section provides the information and procedures necessary to put an FDD into operation.

3.2 UNPACKING

Unpack FDD as follows:

- a. Cut banding and lift top half of styrofoam shell from unit.
- b. Lift unit in polyethylene bag from bottom half of styrofoam shell and remove unit from polyethylene bag.

During unpacking, care must be used so that any tools being used do not inflict damage to the unit. As a unit is unpacked, inspect it for possible shipping damage. All claims for this type of damage should be filed promptly with the carrier involved. If a claim is filed for damages, save the original packing materials.

3.3 INSTALLATION

Install the FDD in the designated location in the host equipment. Remove blank head protective diskette from unit.

3.4 CABLING AND CONNECTIONS

Connect the AC cable, I/O cable, and DC cable if applicable between the FDD and host equipment. Adequate circuit protective devices must be provided by the host equipment to meet applicable safety standards.

3.4.1 INPUT-OUTPUT CABLE

The maximum cable length from connector to connector is 25 feet (7.62 m). The characteristic impedance should be 150 ohms.

The information relative to the I/O connector (J1) and pin/signal assignments are defined in Figures 5-1, 5-3 and 5-4.

The terminating resistor pack RM3 (see Figure 5-4) is to be installed in the end FDD (farthest from the controller) ONLY. Terminators in more than one FDD may result in damage to the controller.

3.4.2 DC POWER CONNECTION

The mating connector cable should consist of 18 AWG minimum. Refer to Figure 3-2 for connector part numbers.

3.4.3 AC POWER CONNECTION

The mating connector cable should consist of stranded wire, 18 AWG minimum with center-pin connection utilized as frame ground. Refer to Figure 3-1 connector part numbers and attachment.

3.5 ENVIRONMENT

Operating and storage environments of the FDD are as follows:

Operating: 40° to 115°F (4.4° to 46.1°C) 12°F (6.6°C)/hr max. fluctuation
20% to 80% relative humidity
(providing there is no condensation)

Non-Operating: -30° to +150°F (-35° to 65°C)
5% to 95% relative humidity
(providing there is no condensation)
Max. Wet Bulb 80°F (27°C).

3.6 INITIAL CHECKOUT

This procedure should be used to determine that the FDD is operational. The procedure assumes that the unit is installed and the I/O and power cables are connected.

- a. Apply AC power to unit and visually check that the spindle rotates. NOTE:
Assure that the shipping insert has been removed before applying power.
- b. Apply DC power to unit.
- c. Close one of the Drive Select Switches.
- d. Insert diskette as described in Section 2.
- e. Apply a head-load-command signal to the unit and close the access door. Check that the head-load solenoid actuates, and the door microswitch is actuated.
- f. Apply a stepping-command signal to the unit and check that the actuator steps the head as commanded.
- g. Remove the command signals and power from the unit.
- h. Remove diskette.

3.6.1 OPERATION FREQUENCY

If the required operating frequency is different than that which the unit is configured, the procedure for converting operating frequencies using the dual-diameter reversible pulley is provided in Section 6, "Frequency Conversion".

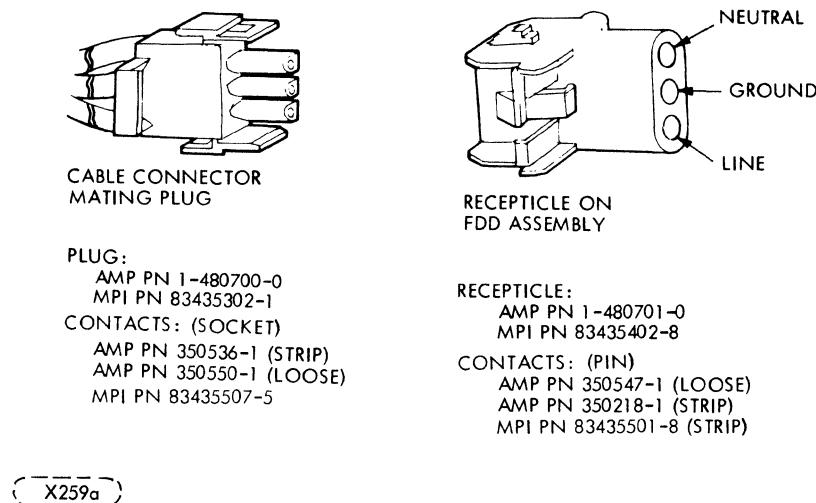


FIGURE 3-1. AC CABLE ASSEMBLY

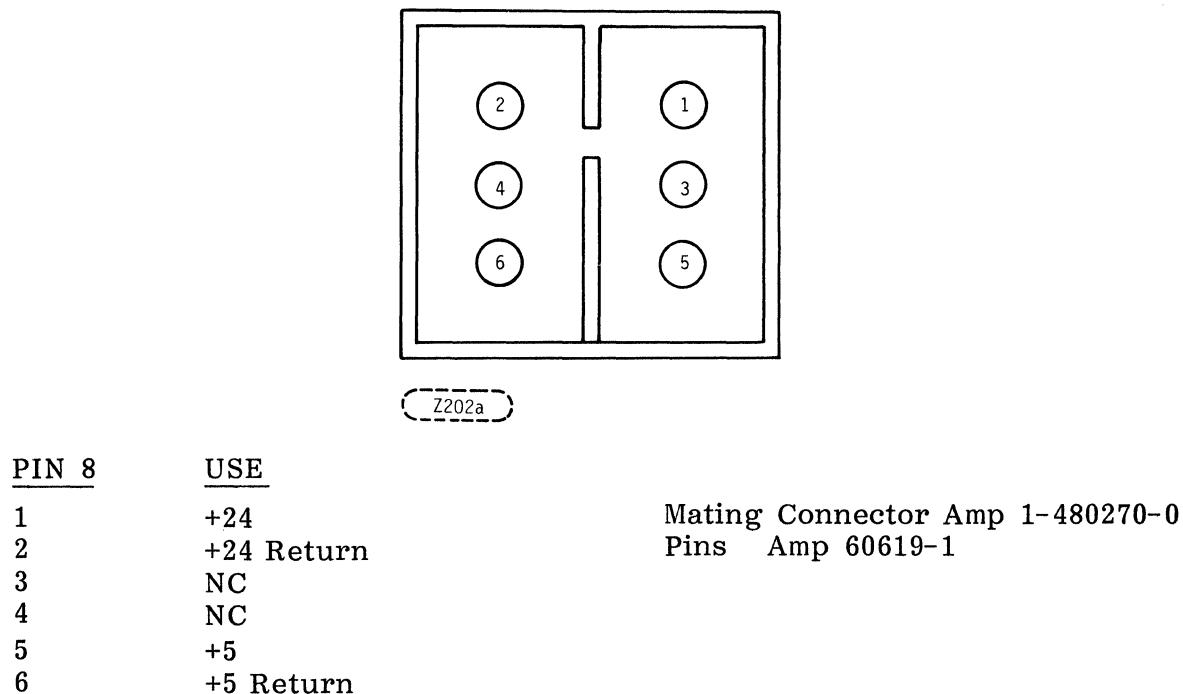


FIGURE 3-2. DC CONNECTOR

4.1 INTRODUCTION

The basic functions performed by the FDD are: (1) receive and generate control signals, (2) position the Read/Write heads on selected tracks, and (3) write or read data upon command from the FDD controller. These functions are accomplished upon selection after initial indication to the controller that the FDD is ready to operate and accept commands.

The theory of operation for the FDD is divided into two parts. The first part gives a general theory of operation. The second part gives a detailed functional description of all major components, both electronic and mechanical, and describes all signals exchanged between the FDD and the controller.

Sections 4 and 5, Theory of Operations and Diagrams, respectively, which follow, detail operation of both hard-sector/data-separation configurations covering PWA's

7761545X	7761895X
7761160X	7762489X

and soft-sector/composite-read-data configuration(s) covering PWA

7764995X.

Operational differences for the soft-sector/composite-read-data configuration will be explained parenthetically or by separate illustration.

Separate PWA's and schematics for both sets of configurations are contained in Section 5.

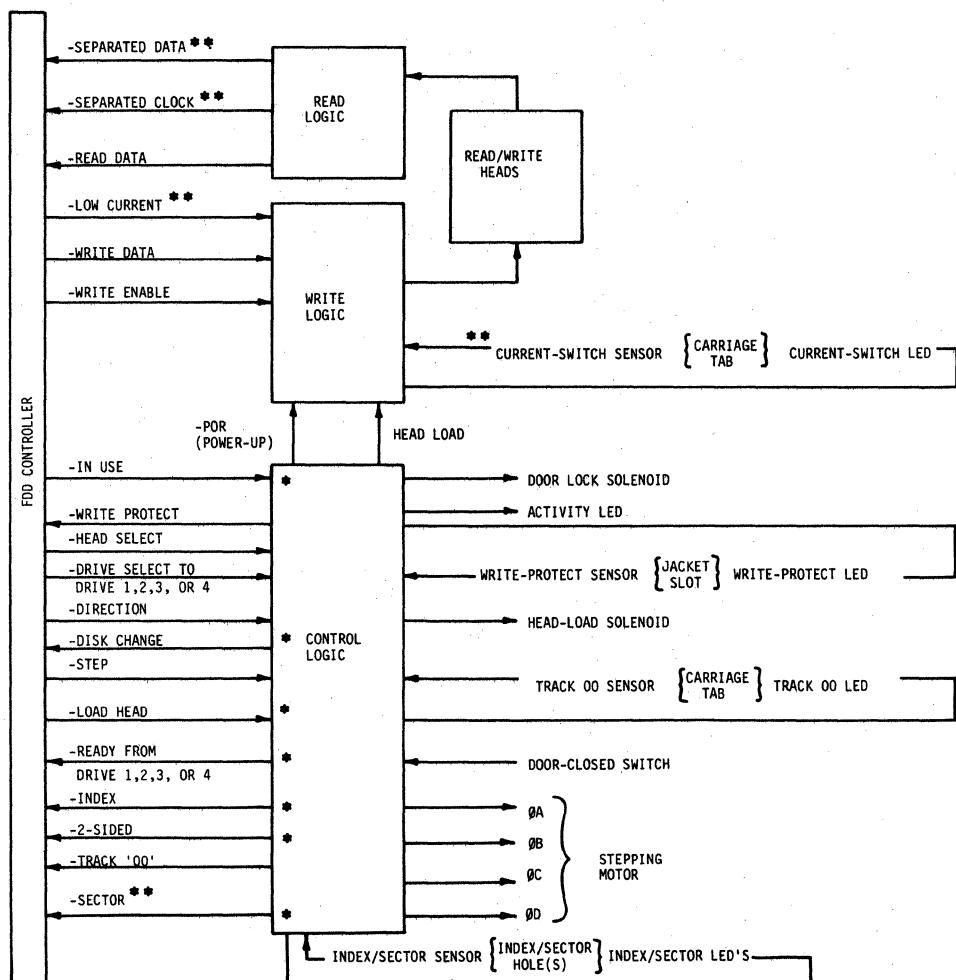
4.2 GENERAL DESCRIPTION

The basic function of the FDD is to indicate to the controller when it is ready to operate, and respond to the commands of the controller to: (1) receive and generate control signals; (2) position the Read/Write heads to selected tracks; and (3) write or read data on the diskette when selected. All of the functions described which are options are jumper connectable.

Signals received and transmitted by the FDD are shown in Figure 4-1. Some signals received by the FDD are gated with Drive Select so that no stepping, reading or writing can be performed on an unselected FDD. Also, some signals generated within the FDD are gated with Drive Select so that they can not be transmitted from an unselected FDD.

During the write operation, the selected FDD must have heads loaded, Head Select, Write Enable, Write Data signals. The Write Enable line remaining high implies a read operation. Under these conditions, the FDD will transmit -Read Data, Sep Clock and -Sep Data signals (soft-sector mode if so equipped) to the controller. Controller Step and Direction commands are received initiating a track-seek operation on a selected FDD. The selected FDD transmits a Track'00 signal to the controller whenever the Read/Write heads are at Track 00.

Positioning of the carriage-mounted Read/Write heads is accomplished by a band-driven stepper motor. Each step command from the user system increments the stepper motor which, in turn, moves the band. The band increments the Read/Write heads one track position for each step command.



* MAY USE OPTIONAL ALTERNATE I/O LINES
 ** OPTIONAL DEPENDING ON PWA CONFIGURATION.

72026

FIGURE 4-1. FUNCTIONAL BLOCK DIAGRAM

A reading or writing operation begins by placing the Read/Write heads in contact with the diskette with a Head-Load command and at the desired track. To write on the diskette, Write Enable is sent by the controller to condition the write logic. The write current then in the head, reverses polarity synchronous with the high-to-low transitions of the Write-Data pulses from the controller. The current reversals cause magnetic flux reversals on the desired diskette track. Erasure of previously recorded data is simultaneously accomplished during the writing operation in addition to a delayed-tunnel-erase which ensures disk interchangeability.

To read from the diskette, magnetized bits in the format of the pre-recorded data are sensed by the Read/Write heads. This signal is amplified, digitized and transmitted to the user system.

4.3 FUNCTIONAL DESCRIPTION

Refer to Figures 4-1, 5-2, and the Schematic Diagram (Section 5) for the following discussion.

The FDD is divided into the following major functional areas:

a. Control Logic	f. Read/Write Head
b. Write Logic	g. Index
c. Stepper Control	h. Door Lock
d. Read Logic	i. Drive Select
e. Diskette Drive	

4.3.1 CONTROL LOGIC

The functions of the control logic are to generate the signals that: (a) establish the ready status of the FDD; (b) step the Read/Write heads in or out upon selection and command of the controller; (c) load the heads on the diskette for read/write operations; (d) protect the diskette from writing if the write-protect slot is present; (e) indicate when the Read/Write head is at Track 00; (f) generate the Index and Sector pulses when the diskette is rotating and the FDD is selected; (g) lock the FDD door latch; (h) unit selection of the FDD; (i) select head 0 or 1 for Read/Write operation; (j) indicate that the door has been open while the drive was not selected; (k) indicate single or two-sided diskette; (l) indicate visually that the drive has one or more functions performed by the Activity LED.

a. Drive Ready

This line is used to indicate to the FDD controller that the diskette is inserted correctly, the door is closed, and that two index pulses have been detected. This line is not inhibited by the select line within the drive. This line can be inhibited by Drive Sel at the ready output. Shunts R, RR and DR may apply.

If a single-sided diskette is installed when shunt DR is present, READY will be active (logical zero) if head 0 is selected, but false (logical 1) if head 0 is selected. Conversely, if a two-sided diskette is installed, READY will be active when either side of the diskette is selected.

When shunt DR is removed and a single-sided diskette is inserted, head 0 or head 1 may be selected and READY will not be inhibited.

1. Radial Ready

This option enables the user to monitor the Ready line of each drive on the interface. This can be useful in detecting when an operator has removed or installed a diskette in any drive. Normally, the Ready line from a drive is only available to the interface when it is selected.

Shunt RR must be absent on each FDD used on the interface when this option is used. Shunt R may be present on only one FDD on the interface; this FDD will have Ready on output pin 22. The remaining FDDs in the interface must utilize their own Ready lines, each using a different alternate I/O line. These outputs may be wire-wrapped or soldered to the appropriate staked pins with 30-gauge wire (see Figure 5-3, sheet 3).

b. Power on Reset

At initial voltage application, flip flop U14 and counter U18 are asynchronously reset through the action of comparator U4. At the instant the 5V appears, U4 pin 7 will go high, forcing output pins 8,11,12 and 9 of U18 high and pin 6 of U14 high. As capacitor C6 is charged, U4 pin 7 will switch low, assisted by hysteresis. This will cause the reset signal to go false and remain there as long as the +5 volts remains present.

c. Stepper Circuit

Each step command received initiates a step sequence that controls the stepper motor. The logic level of the Direction signal determines whether the phase sequence is stepping in or out per Table 4-1.

TABLE 4-1. PHASE SEQUENCE OF STEPPER MOTOR

<u>Change the Active Φ</u>		<u>To Step One Track</u>
<u>From</u>	<u>To</u>	
A	A+B	
A+B	B	IN
B	B+C	
B+C	C	
<hr/>		
A	A+D	
A+D	D	OUT
D	C+D	
C+D	C	

Movement of the Read/Write head is initiated by the step commands from the controller; the head is stepped one track, either toward the spindle (IN) or away from the spindle (OUT), with each step command. The direction is regulated by the status of the Direction line (a low level of the Direction line causes the Read/Write head to step toward the spindle, and a high level causes the Read/Write head to step away from the spindle). Shunt NS must be present.

Drive to the specific stepper motor phases, A, B, C, and D is provided by logic-driven Darlington transistors Q2, 3, 4, and 1. Step information is decoded by the programmed ROM (Read-Only Memory) U16 and is used to control the driver transistors. The ROM is controlled by the start-stop sequence generator, U19 pin 7, U17 pin 6, U17 pin 3, U18 pin 12, U20 pin 3 and U20 pin 6. The circuit at U17 pin 6 produces a pulse for each trailing edge of U19 pin 6 and 7. The circuits at U20 pin 3 and U20 pin 6 produce a pulse for each edge change on the input. The sequence generator is started by step pulses from U19 pin 9. It is stopped after the proper sequence by U16 pin 5 shaped by U31 pin 13. The timing of U19 pin 6 controls the speed of the sequence generator and nominally is set at 0.5 ms.

One-shot U15 pin 10 is continuously being retriggered by the step pulse and times out on the last pulse. One-shot U15 pin 10 controls how long +24 volts will be applied to the stepper motor. One-shot U22 pin 7 is triggered by the last step information and is used to control settling time. It triggers U22 pin 9 to reapply +24 volts to the stepper motor for final position accuracy. One-shot U15 pin 6 determines the duration of the reverse step damping. Power on reset will cause the stepper motor to sequence to $\emptyset A$ by resetting counter U18.

d. Head Load and Door Closed

The Read/Write heads of a selected FDD can be loaded when the disk is fully installed and the front-panel door is closed. Closing the front-panel door actuates the door-closed switch which completes the circuit to the head-load solenoid. When the controller sends a Head-Load signal, the head-load solenoid is energized causing the load plate to actuate. The actuation of the load plate permits the head arms to load the heads against the diskette surface. The door-closed switch also is used to inhibit the READY signal when the door is open.

The head is loaded by energizing the solenoid through R69 which slows down the pull-in of the solenoid. After a delay, full current is applied to the solenoid through both gate U43. (In soft-sector operation, the head is loaded by energizing the solenoid through U23 which slows down the pull-in and drop-out of the solenoid.) There are several different options when configuring head load (see Figure 5-3, sheet 3). Shunts C, DD, A, D, X and B may apply.

e. Write Protect

The Write-Protect function is accomplished through use of an LED (light-emitted diode) and a photo-transistor. These are mounted such that the presence of a Write Protect slot in the jacket of the diskette will cause pin 2 of comparator U32 to be driven high. This signal is gated with Drive Select and Write Enable to inhibit writing on any diskette possessing a write-protect slot. Shunt WP enables write inhibit; shunt NP allows writing while write-protected (see Figure 5-3, Sheet 2).

f. Track Zero

Track 00 signal is generated when the carriage-assembly tab is sensed by the Track 00 optical switch. Closing this switch causes U32 Pin 1 to switch high assisted by hysteresis. The output is gated with $\emptyset A$, Drive Select, and Step Out direction to provide the Track 00 signal that is transmitted to the controller from U45 pin 11.

g. Index, Sector and Diskette-Type Circuitry

The beginning of each diskette track is indicated by an Index pulse. The diskette rotates between a light source (LED) and a sensor (photo transistor). When the Index hole in the diskette passes over the light source, light is detected by the sensor. The sensor output is amplified and transmitted to the controller as the Index pulse when the FDD is selected.

The drive has two Index detectors, one for two-sided diskettes and one for single-sided diskettes. Latch U34 pin 11 and U34 pin 8 determine the type of diskette involved. U34 pin 11 is set high for a two-sided diskette and low for a single-sided diskette. (In soft-sector operations, flip flop U48 determines the type of diskette involved. U48 pin 5 is set high for a two-sided diskette and low for a single-sided diskette.) This signal is gated with Drive Select and sent to the interface by U42 pin 8 through shunt 2S.

Two-sided and single-sided Index is gated at U20 pins 9 and 10 and is provided to U25 pin 12 for shaping. (For soft-sector-mode operation, two-sided or single-sided Index is gated at U20 pin 8 and is provided to U25 pin 12 for shaping.)

An Index/Sector separator is provided on the FDD (available on 7761545X and 7762489X PWA's) with hard-sectored diskettes. Proper operation of the Ready function requires that the Index pulses be separated in the FDD. The composite Index/Sector signal is applied to input pin 5 of one-shot multivibrator U25. Feedback from output pin 6 to input pin 4 causes the one-shot to be non-retriggerable. ANDing the two outputs with the composite Index/Sector signal provides the separated Index and Sector signals. Whenever a 32-hole hard-sectored diskette is used, Index/Sector pulses arrive at 5.2 ms intervals with one Index pulse nested between two sector pulses at 1.6 μ s nominally. When using the hard-sector functions, Index and Sector pulse-output widths are 0.4 ± 0.2 ms when shunt E is installed.

When using the soft-sector function, the Index output-pulse width is 1.8 ± 0.4 μ s. Shunts SS, HS, RI S and I may be applicable (see Figure 5-3, sheet 3).

h. Door Lock and In Use

The Door Lock circuit can be latched on under Drive Select control so that the door can remain locked without maintaining the active state of In Use. To implement this option, install shunts D and DL. Then, if the appropriate Drive Select line is activated while In Use is active, U37-9 will be set, which holds the door-lock circuit active. To unlock the door, Drive Select is activated again while In Use is inactive. This will reset U37-9.

The Door Lock may also be optioned such that is is only active while the In Use line is active. Shunt D is installed; shunt DL is removed.

With shunts D and DL removed, Door Lock will be active whenever the heads are loaded.

i. Drive Select

The Drive Select function will inhibit command and status signals such as Index, Sector, Head Load, Write Data and Ready unless optioned otherwise. The position of the FDD in a daisy-chain configuration is determined by the activation of switch 1. Shunts DD and A apply. (See Figure 5-3, sheet 3.)

4.3.2 WRITE LOGIC

A write operation begins with a Write Enable command from the controller when the FDD is selected. This command simultaneously enables the Write-Data switching drivers (flip flop U12 pins 5 and 6), the Write-Data gate U33 pin 6, blocks the input to the read circuit by reverse-biasing diodes in U24, and after a delay energizes the erase windings. Data applied to the Write-Data input alternately switches a constant write current through the write drivers to the head windings. Low-current operation, used when writing on track 43 and greater, is selected by switching a shunt resistor R65 into the write-current source. Current source U30 provides current to the emitters of the write transistors U30.

4.3.3 HEAD-SELECT LOGIC

Head-Select signal when low selects head 1 by turning on U36 pin 8 causing its collector to be at +12 volts while U36 pin 14 is at ground. When the Head-Select signal goes high, it will cause U36 pin 8 to ground and U36 pin 14 to +12 volts selecting head 0. Q6 and U36 pin 7 control the +12 voltage with respect to loss of +5 control voltage. Shunt S2 applies. Head selection may be performed by the direction line if optioned by installing shunt S1. When direction is low, head 1 is selected. When direction is high head 0 is selected.

In systems containing no more than two drives per controller, each Read/Write head can be assigned a separate drive address. In such cases, the four Drive Select lines can be used to select the four Read/Write heads. To implement this option, install shunt S3 and properly set switch S1. For example, the first drive may have switch 1-8 and 3 closed while the second drive has switch 1-6 and 1 closed. With this jumper configuration installed, the four Drive Select lines have the following selection functions:

1. Drive Select 1 selects head 0 of first drive;
2. Drive Select 2 selects head 0 of first drive;
3. Drive Select 3 selects head 0 of second drive;
4. Drive Select 4 selects head 1 of second drive.

(Refer to Figure 5-3, schematic sheets 2 and 3.)

4.3.4 DISK CHANGE

This customer-installable option is enabled by installing shunt DC. It will provide a true signal (logical zero) to the interface (pin 12) when Drive Select is activated, if while deselected the drive has gone from a Ready to a Not Ready (door open) condition. This line is a reset on the true to false transition of Drive Select if the drive has gone Ready. Timing of this line is illustrated in Figure 5-2. The circuitry is illustrated in Figure 5-3, schematic sheet 3. The output of flip-flop U37 pin 6, goes high when the door is opened, but output gate U45-8 is not enabled until the drive is selected. When the Drive Select line goes false, U37 pin 5 will be clocked high.

4.3.5 READ LOGIC

Read operation is enabled when the Read/Write heads are loaded on the diskette and Write Enable is not commanded. With Write Enable not commanded, the data-blocking diodes U24 are forward-biased and data sensed by the Read/Write head is fed to the Read Data circuit. The read signal from the diskette is in the form of a sine wave.

This analog signal is amplified by U21, filtered, differentiated by C27/R26 and C28/R27, amplified by U8, and coupled to a comparator/logic circuit to detect zero crossings and reject noise in the differentiated read signal.

The out-of-phase comparators U1 pins 7 and 12 have rise and fall times whose differences are exaggerated by slow-down capacitor C5. This results in a narrow negative pulse at U9 pin 11 which triggers a one-microsecond retriggerable one-shot, U2 pin 9.

Flip flop U12 pins 8 and 9 perform a noise-rejection function in that noise near the zero crossings of the amplified differentiated data only result in retriggering U2 pin 9. This appears as jitter in the clock for the flip flop whose data input, derived from redundant comparator U4 pin 12, has by that time stabilized.

Another slow-down capacitor, C12 causes a negative pulse to appear at the output of U9 pin 8 whenever the flop flop toggles. Although shifted in time by approximately the delay of one-shot U2 pin 9, each pulse corresponds to a zero crossing of the differentiated signal, and a peak of the analog read signal. Jitter at the flip-flop clock input and U9 pin 8, which is due to noise at the zero crossings, will not affect the 200-ns composite-data pulse width (see Figure 5-3, schematic sheet 4).

False clock and data separation is an option provided on the 7761545X and 7762489X PWA's by the 3/4-cell one-shot U3 pin 7. It times out 2.9 microseconds from the leading edge of the 200-nanosecond composite data pulse. During the timeout of the one shot, the DC reset is removed from (wired flip-flop gates U5-8 and U5-11) U5 pin 13. This enables the flip flop to clock a high from the data input U5 pin 12 to output U5 pin 5 on the trailing edge of the composite data pulse. (NOTE: The separator must be preconditioned with two cells of "zero" data bits for proper operation.) When the flip flop changes state, steering logic gates U5 pins 6 and 3 hold the clocking inputs to the one shot and flip flop high. The separated clock signal is held high during this interval through the identical action of gates U13 pin 4 and U46 pin 8 to U5 pin 3. The flip flop enables the "one" data bit to appear at U5 pin 6, U13 pin 10 and U46 pin 11 during this 3/4-cell time. If no "one" data bit is present in the composite data, the -Read Data Separated signal will remain high. At the end of the 3/4-cell timeout, the flip flop is reset to repeat the operation. Shunt jumper FS must be present.

True clock and data separation is an option provided on the 7761545X and 7762489X PWA's by a 2- μ s clock time one-shot U3 pin 9 and flip flop U10 pin 8. U11 pin 6, U11 pin 8 and U10 pin 6 act as a pulse counter and provide synchronization so that true separated clock and data will be present at J1-50 and J1-48 when using IBM-compatible single-density format where three consecutive missing clocks would be encountered. (NOTE: This synch circuit must be preconditioned by four cells of "zero" data bits for proper operation.) Shunt TS must be in place to enable this option.

4.3.6 DISKETTE DRIVE

Diskette drive is accomplished by clamping the diskette between the cone assembly and belt-driven spindle. The spindle is rotated at 360 r/min by the diskette drive motor. A dual pulley permits 50- or 60-Hz operation without a motor change.

4.3.7 READ/WRITE HEADS

The Read/Write heads are in direct contact with the diskette during read or write operation. Head load is achieved by a solenoid-actuated load plate allowing the head arms to load the Read/Write heads against the diskette. The head surfaces are designed for maximum signal transfer to and from the magnetic surface of the diskette with minimum head/disk wear. The tunnel-erase gap DC-erases the intra-track area to improve offtrack signal-to-noise ratio and permit diskette interchange between drives.

4.4 CONTROL AND DATA LINE CHARACTERISTICS

All signal lines must be terminated at the receiver with a characteristic impedance of 150-ohms, typically. Transmission is by 26 AWG (min.), 150-ohm flat cable or twisted pair (one twist per inch) with a maximum line length of 25 feet. Figure 5-1 shows the timing of typical operations.

4.4.1 LOGIC LEVELS

The following definitions will be used throughout this manual:

low = Logic 1, Active State Refers to the low-voltage condition +0.4VDC Max.

high = Logic 0, Inactive State Refers to the high-voltage condition
+2.4VDC Min.

4.4.2 TRANSMITTER CHARACTERISTICS

The FDD uses the TTL7438 (quad 2-input buffer or driver) or equivalent to transmit all control and data signals. This transmitter is capable of sinking a current of 48 ma with an output voltage of 0.4 volts.

4.4.3 LINE-RECEIVER CHARACTERISTICS

The FDD uses the SN7400 family gates or equivalent for line receivers. The input of each receiver is terminated in 150 ohms.

4.4.4 CONTROL AND DATA LINE FUNCTIONS

The signals that are exchanged are described in Table 4-2 and are shown relative to a point of origin in Figure 4-1.

TABLE 4-2. INPUT/OUTPUT LINES

SIGNAL	FUNCTION
<u>INPUT LINES</u>	
-STEP	A 1- microsecond (minimum) logic 1 level pulse on this line causes the head to move one track as determined by the direction line.
-DIRECTION	A logic 1 level on this line and step pulse causes the head to move one track inward toward the center of the diskette. A logic 0 level on this line and step pulse causes the head to move one track outward from the center of the diskette. (Refer to paragraph 4.3.3, Head-Select Logic for further usage of the line).
-HEAD LOAD (Alternate I/O)	A logic 1 level on this line loads the heads against the diskette.
-WRITE ENABLE	To enable the FDD write driver, this line is held at a logic 1. To disable the FDD write driver and enable the FDD read circuitry, this line is held at logic zero.
-WRITE DATA	This line contains the composite coded write clock and data information to the FDD.
-LOW CURRENT (Alternate I/O)*	This line reduces write current for tracks 43 or greater. A low level reduces write current. If the FDD uses the Track 43 kit this line will not be applicable.
-DRIVE SELECT (1 of 4 lines)	On this line a logic 1 level with shunts DD and A present and one set of switch 1 contacts closed enables the FDD interface. (Refer to paragraph 4.3.3a, Head Selection, for further usage of these lines.)

*Alternate I/O Unassigned - Unused I/O pins 4,6 and 8. These may be customer defined.

SIGNAL	FUNCTION
<u>INPUT LINES</u>	
-IN USE (Alternate I/O)*	A logic 1 level on this line illuminates an LED indicator on the front panel of the FDD and activates a solenoid which locks the door-latch mechanism preventing opening of the door.
HEAD SELECT	A high level on this line selects head 0 (lower diskette surface). A low selects head 1.
<u>OUTPUT LINES</u>	
-READY	A logic 1 level indicates that the door is closed, a diskette is rotating, and two Index pulses have been sensed. This output may be optioned to use an alternate I/O pin.
-INDEX	This line gives an indication of the rotational position of the diskette by outputting a logic 1 pulse for every Index hole of the diskette. This output may be configured to use an alternate I/O pin if desired.
-SECTOR	This line gives an indication of the rotational position of the diskette by outputting a logic 1 pulse for every sector hole of the diskette. (For soft-sector configurations this line is inactive.) This output may be configured to use an alternate I/O pin.
-DISK CHANGE (Alternate I/O)	This line gives indication that there was a loss of Ready from the Door Closed signal going false while the drive was not selected. The status of this output can only be monitored when the drive is selected.
-TRACK 00	A logic 1 level indicates that the head is positioned over Track 00.
-WRITE PROTECT	Logic 1 level indicates that the write-protect slot on the diskette is uncovered.

*Alternate I/O Unassigned - Unused I/O pins 4, 6 and 8. These may be customer defined.

SIGNAL	FUNCTION
<u>INPUT LINES</u>	
-SEPARATED DATA*	This line contains the separated data information. For soft-sector configuration this line is inactive.
-SEPARATED CLOCK*	This line contains the separated clock information. For soft-sector configurations this line is inactive.
-READ DATA	This line contains the unseparated data and clock information.
TWO-SIDED (Alternate I/O)**	This line is low for a two-sided diskette and high for a single-sided diskette.

*The signals are valid when double-frequency recording without missing clock is used, and shunt FS is present. The signals are valid when double-frequency recording with missing clock is used and shunt TS is present.

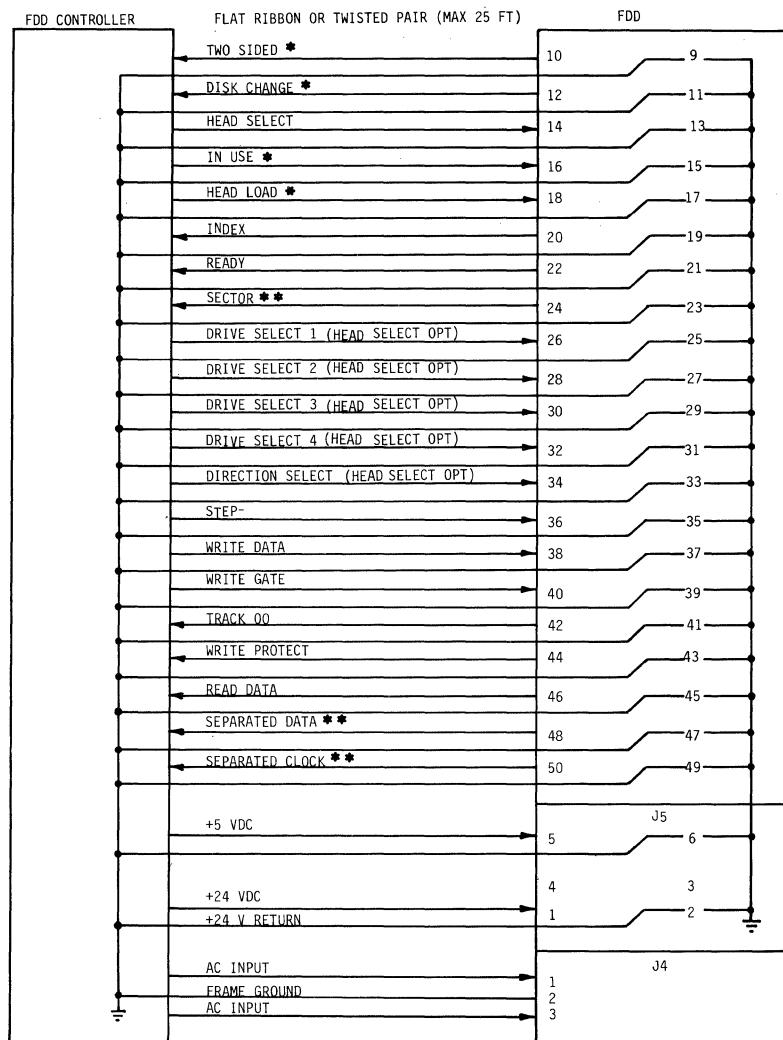
**Alternate I/O Unassigned - Unused I/O pins 4, 6 and 8. These may be customer defined.

5.1 INTRODUCTION

This section contains the printed-circuit-board documentation and related timing diagrams.

Figure 5-1 shows interface connections of all AC, DC and I/O lines applicable to the FDD.

Figure 5-2 shows timing diagrams which illustrate signal/time relationships during read, write, step-in and step-out operations. Figure 5-3 is the printed-circuit board schematic for the universal and soft-sectored configurations and Figure 5-4 contains the assembly drawings for both universal and soft-sectored configurations.



* These lines are alternate input/output lines and they are enabled by shunts.
 Not shown are pins 2, 4, 6 and 8 which are alternate I/O pins.
 ** Universal Configurations only.

2203a

*Reference Section 4 for uses of these lines.

FIGURE 5-1. INTERFACE CONNECTIONS

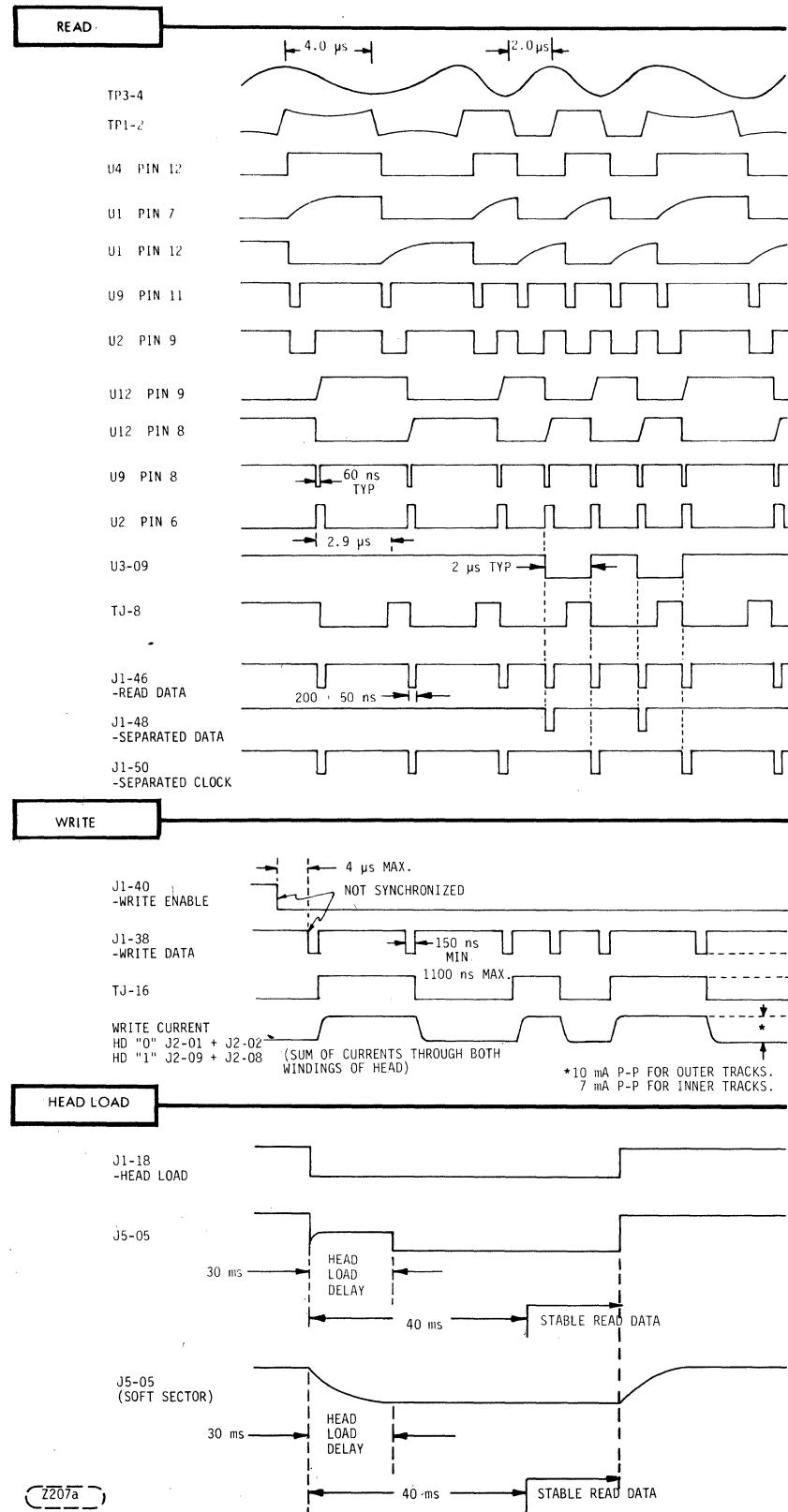
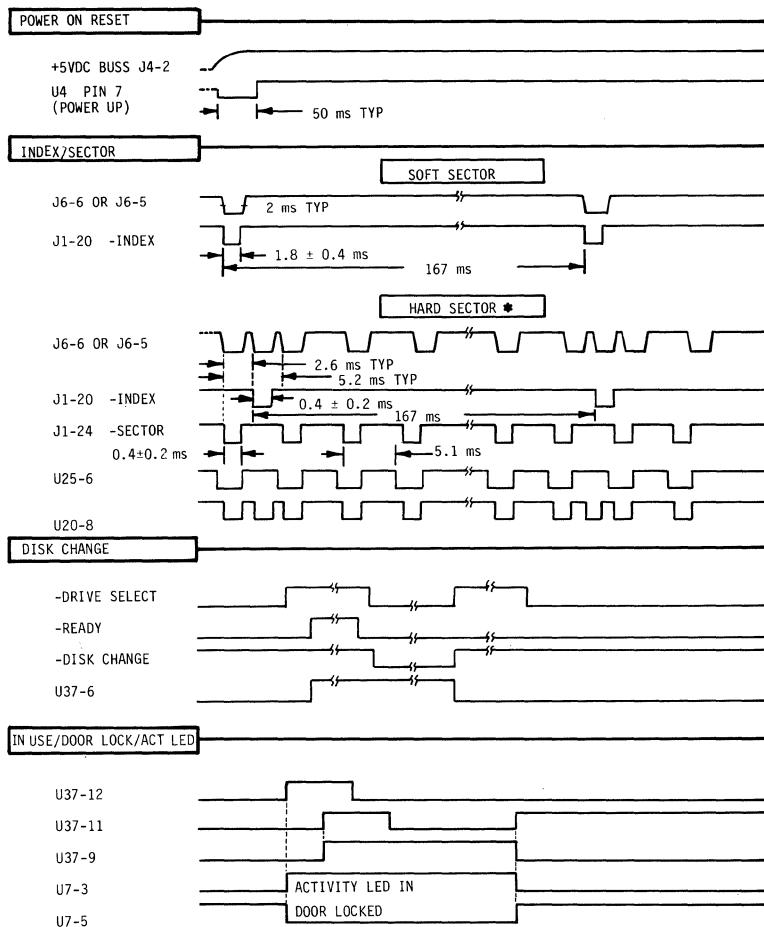


FIGURE 5-2A. TIMING (SHEET 1 OF 2)



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C

FIGURE 5-2A. TIMING (SHEET 2 OF 2)

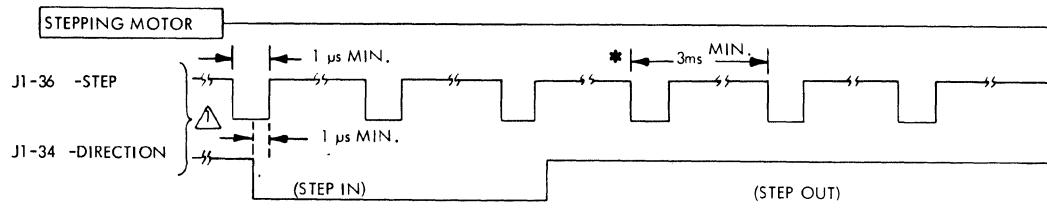


FIGURE 5-2B. STEP/DIRECTION OPERATION

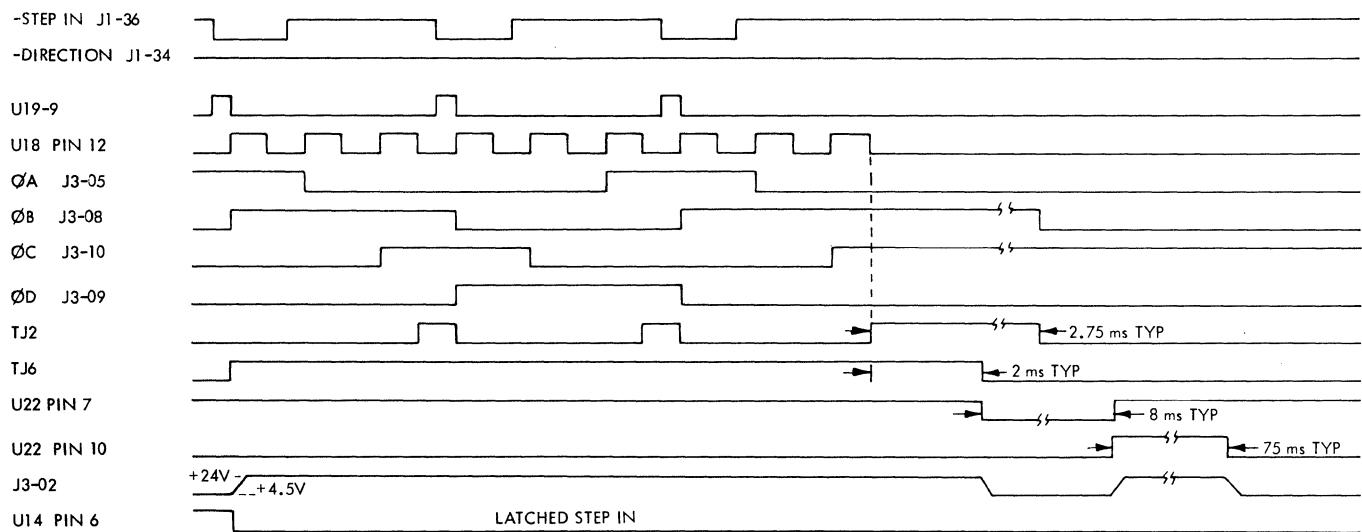


FIGURE 5-2C. STEP-IN OPERATION

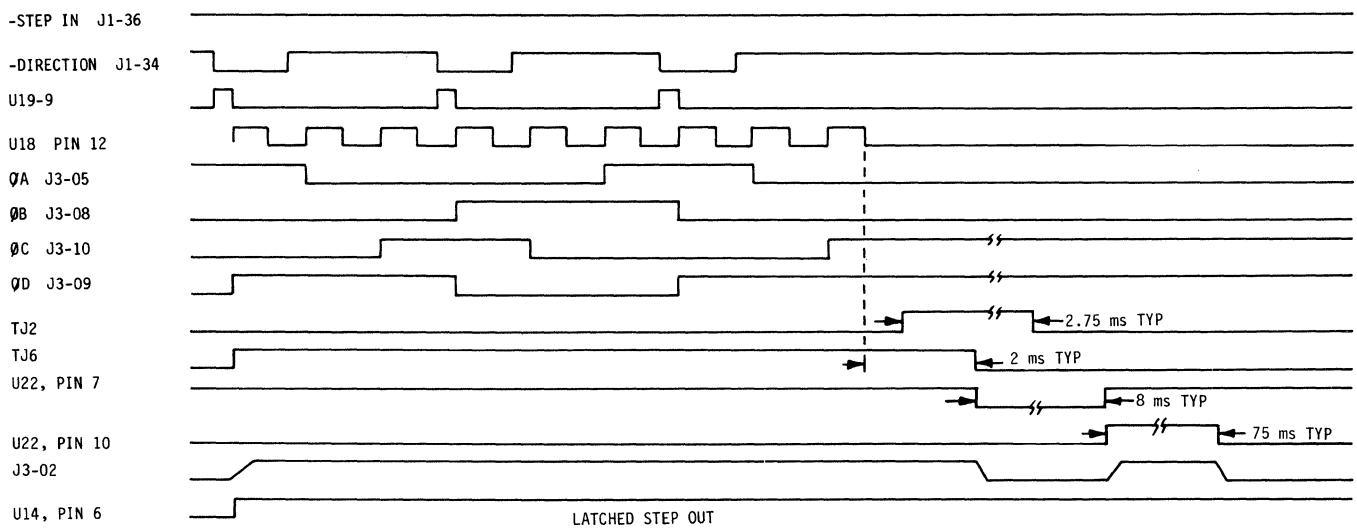


FIGURE 5-2D. STEP-OUT OPERATION

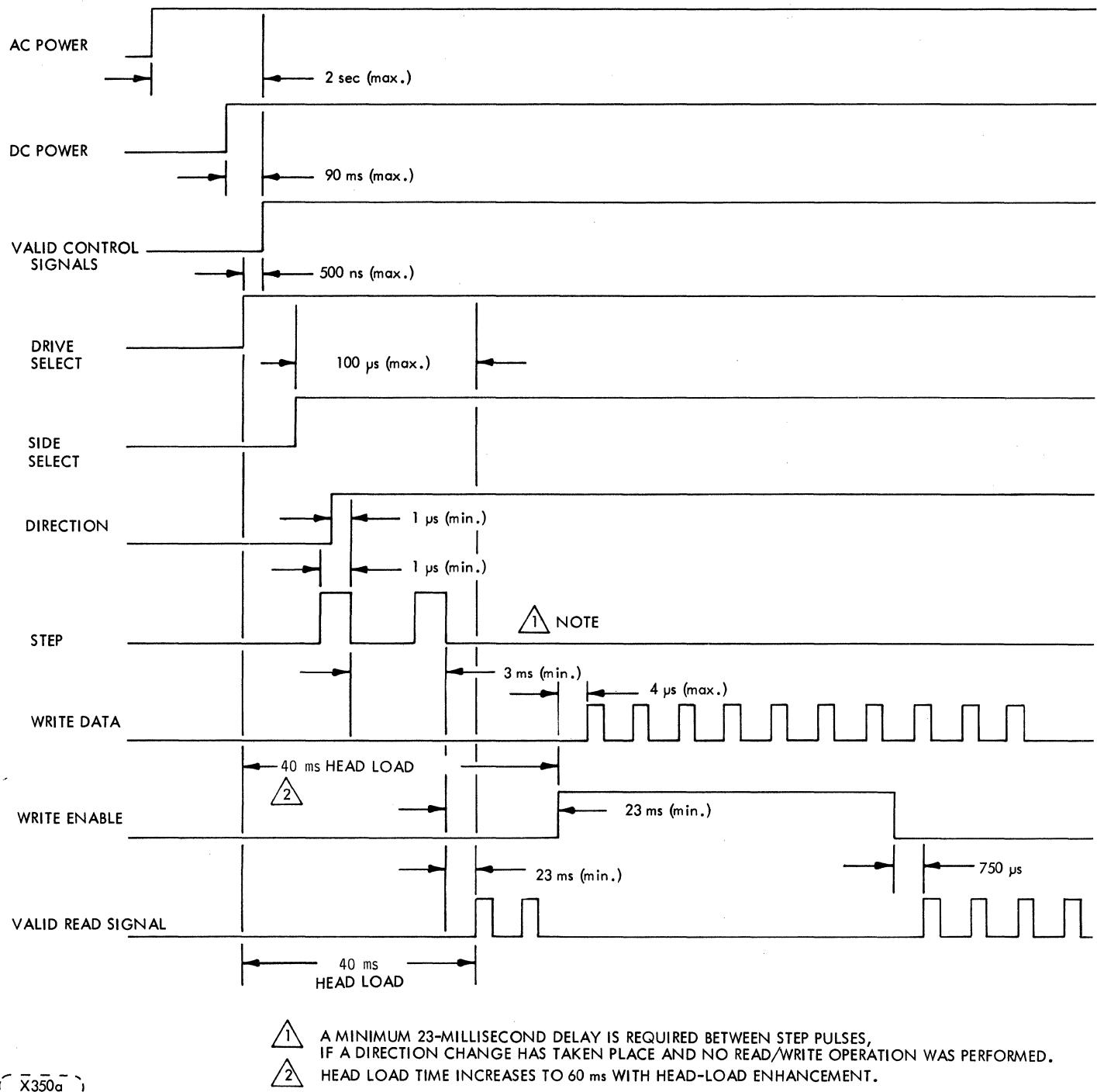
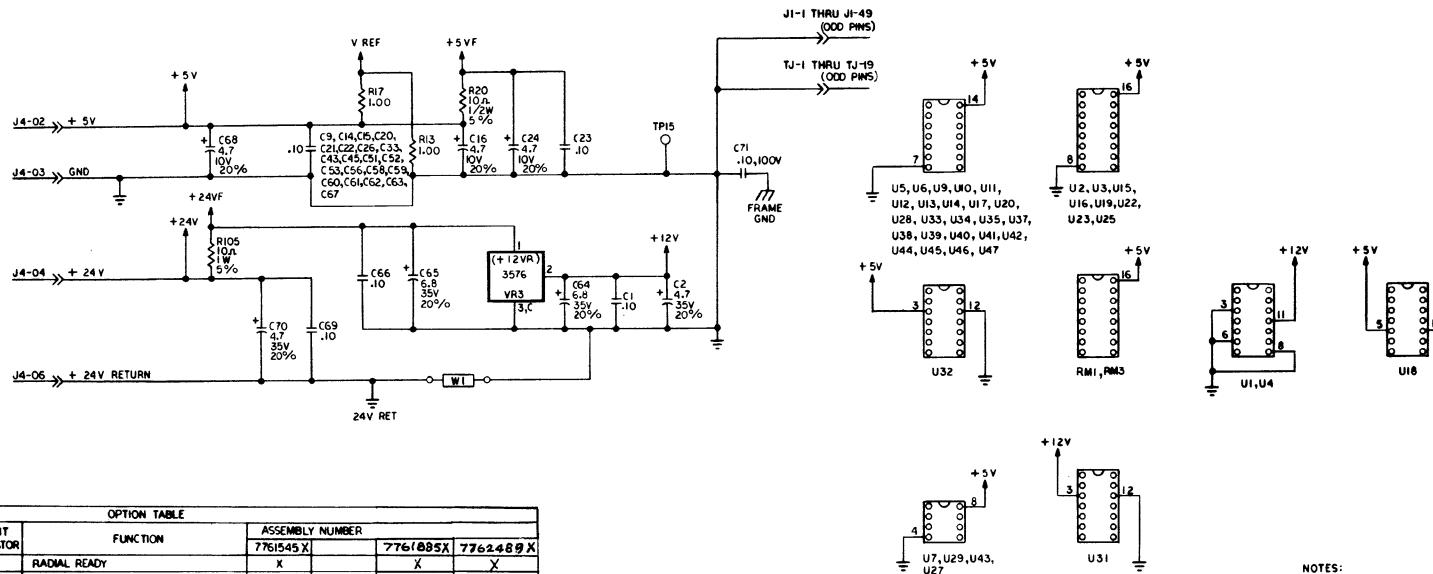


FIGURE 5-2E. GENERAL CONTROL AND DATA TIMING COMBINED

**FIGURE 5-3. SCHEMATICS (SHEET 1 OF 5)
(UNIVERSAL CONFIGURATION)**

OPTION TABLE			
SHUNT DESIGNATOR	FUNCTION	ASSEMBLY NUMBER	
		7761845 X	7761885 X
RR	RADIAL READY	X	X
RI	RADIAL INDEX AND SECTOR	X	X
R	READY OUTPUT	X	X
25	TWO-SIDED STATUS OUTPUT		
HS	HARD SECTOR ENABLE	X	X
SS	SOFT SECTOR ENABLE		
DC	DISK CHANGE		
WP	INHIBIT WRITE WHEN WRITE PROTECTED	X	X
NP	ALLOW WRITE WHEN WRITE PROTECTED	X	X
D	ALTERNATE INPUT-IN USE		
DD	STANDARD DRIVE SELECT ENABLE	X	X
DL	DOOR LOCK LATCH	X	X
A	RADIAL HEAD LOAD	X	X
B	RADIAL HEAD LOAD	X	X
X	RADIAL HEAD LOAD	X	X
C	ALTERNATE INPUT-HEAD LOAD		
Z	IN USE FROM DRIVE SELECT	X	X
Y	IN USE FROM HEAD LOAD		
S1	SIDE SELECT USING DIRECTION SELECT		
S2	STANDARD SIDE SELECT INPUT	X	X
S3	SIDE SELECT USING DRIVE SELECT		
E	.4 ms INDEX PULSE		
DR	DOUBLE SIDE READY		
TS	TRUE SEPARATION	X	X
FS	FALSE SEPARATION		
NS	NORMAL SEEK (STANDARD)	X	X
OS	OPTIONAL SEEK		
HO	ALLOW HEADLOAD	X	X
IU	HEADLOAD WITH IN USE		
I	INDEX OUTPUT	X	X
S	SECTOR OUTPUT	X	X
LC	LOW CURRENT		



NOTES:

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTOR VALUES ARE IN K OHMS, 1/4 W, 1%.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
- △ 3. OPTIONAL J1 CONNECTOR PINS -4, 6, OR 8.

FIGURE 5-3. SCHEMATICS (SHEET 2 OF 5)
(UNIVERSAL CONFIGURATION)

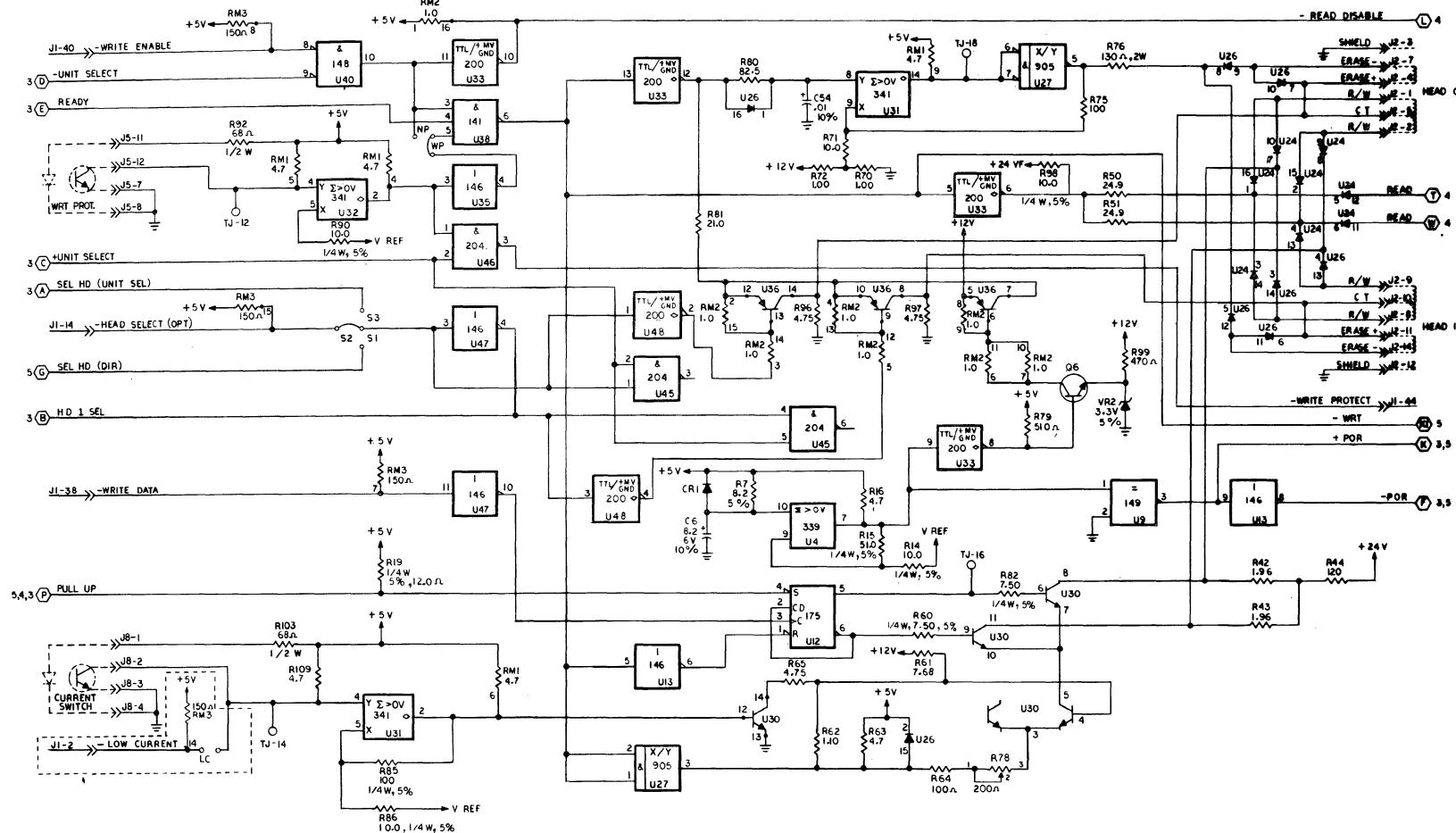


FIGURE 5-3.
SCHEMATICS (SHEET 3 OF 5)
(UNIVERSAL CONFIGURATION)

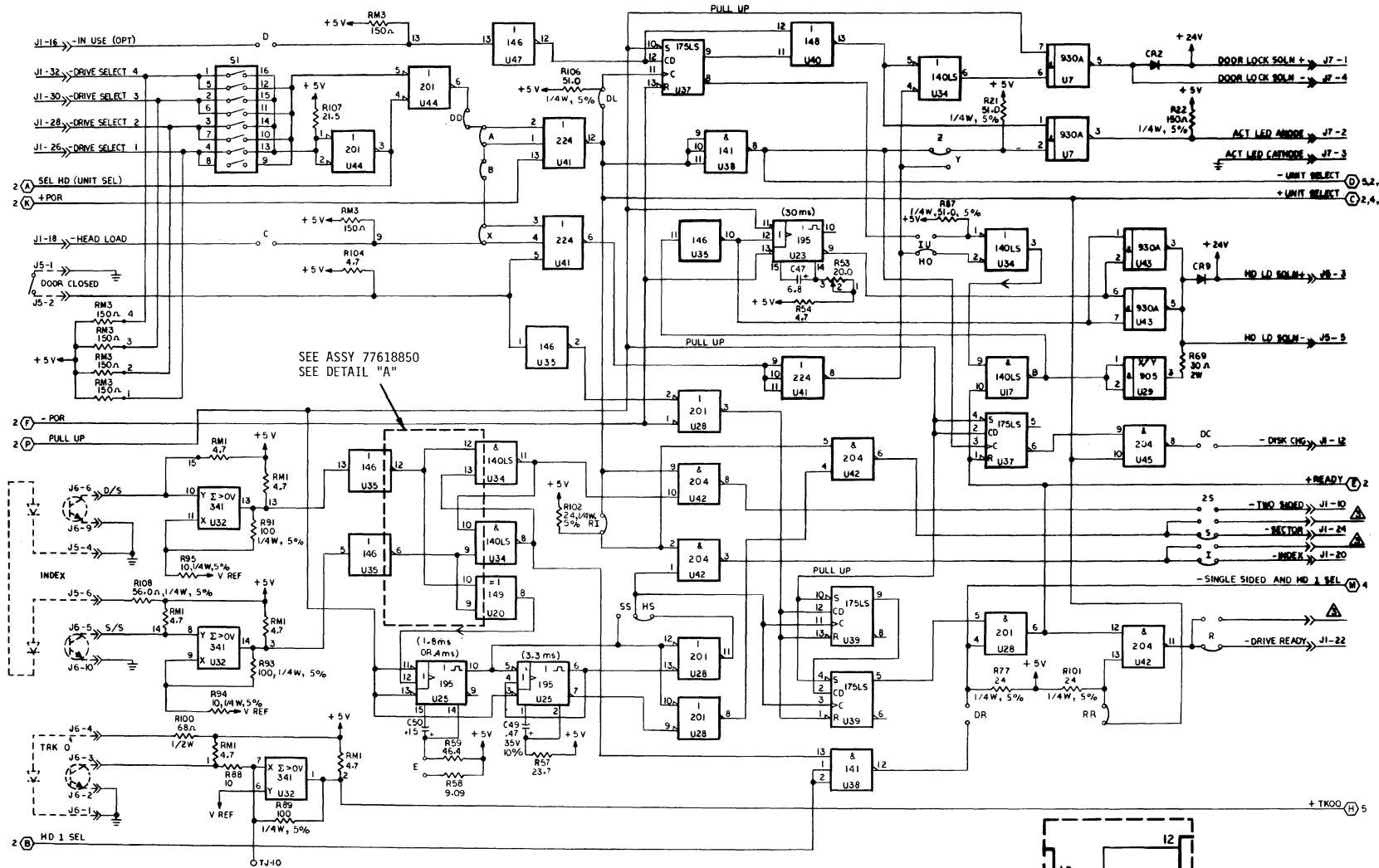
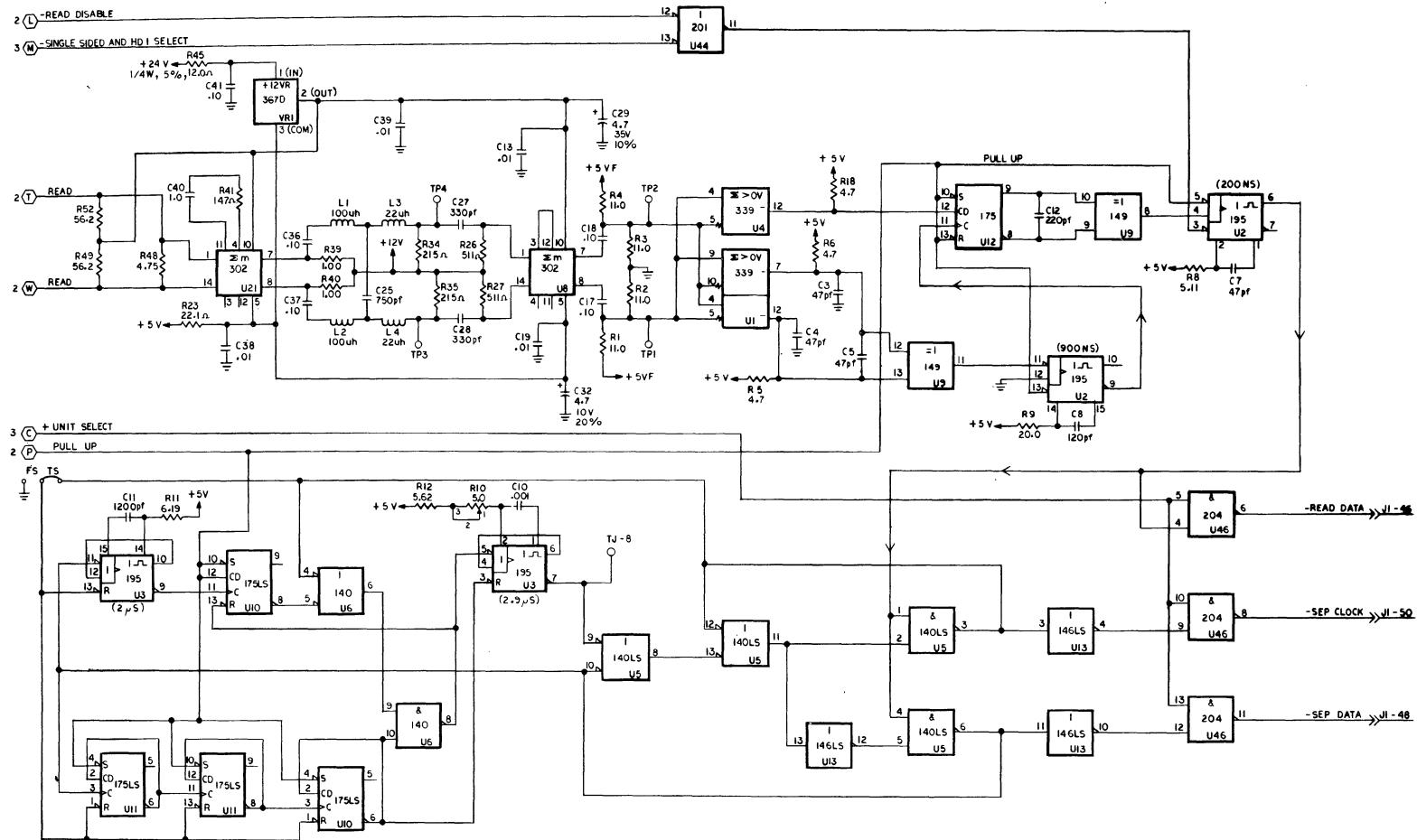
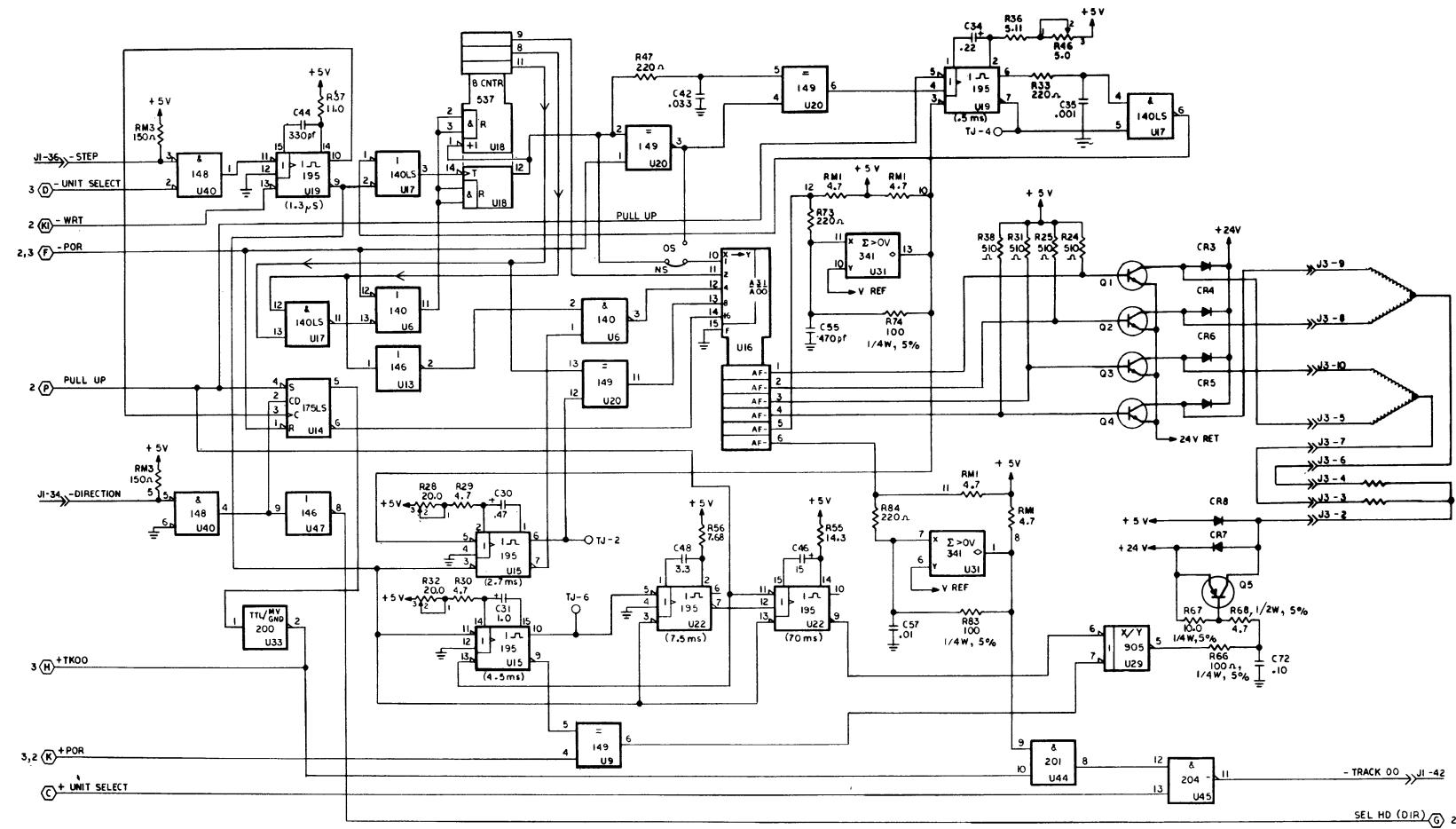
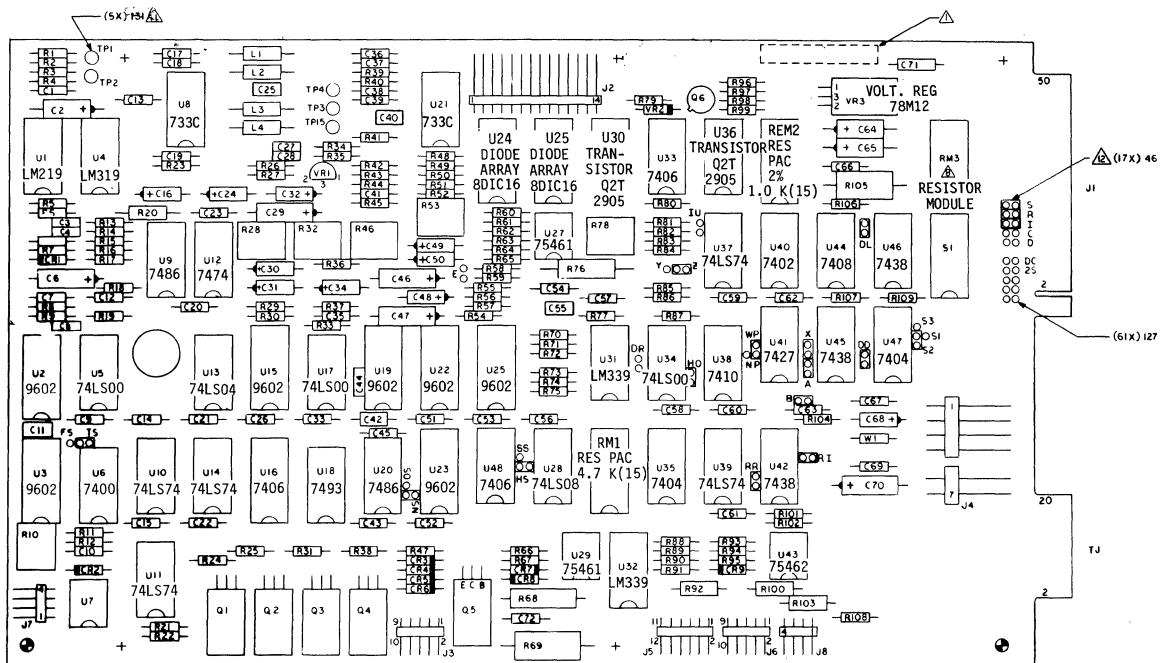


FIGURE 5-3. SCHEMATICS (SHEET 4 OF 5)
(UNIVERSAL CONFIGURATION)



**FIGURE 5-3. SCHEMATICS (SHEET 5 OF 5)
(UNIVERSAL CONFIGURATION)**





TRANSISTORS: Q1,Q2,Q3,Q4 - T1P120
Q5 - T1P125
Q6 - 2N2222

DIODES: CR1,CR2,CR9 - 1N914A
CR3,CR4,CR5,CR6,CR7,CR8 - 1N4001

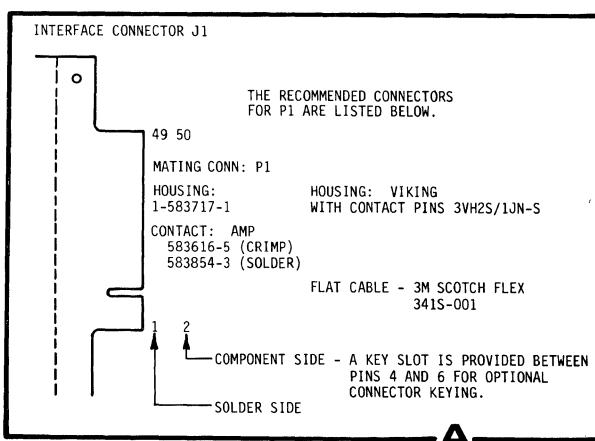
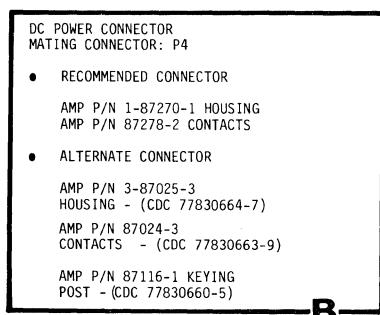
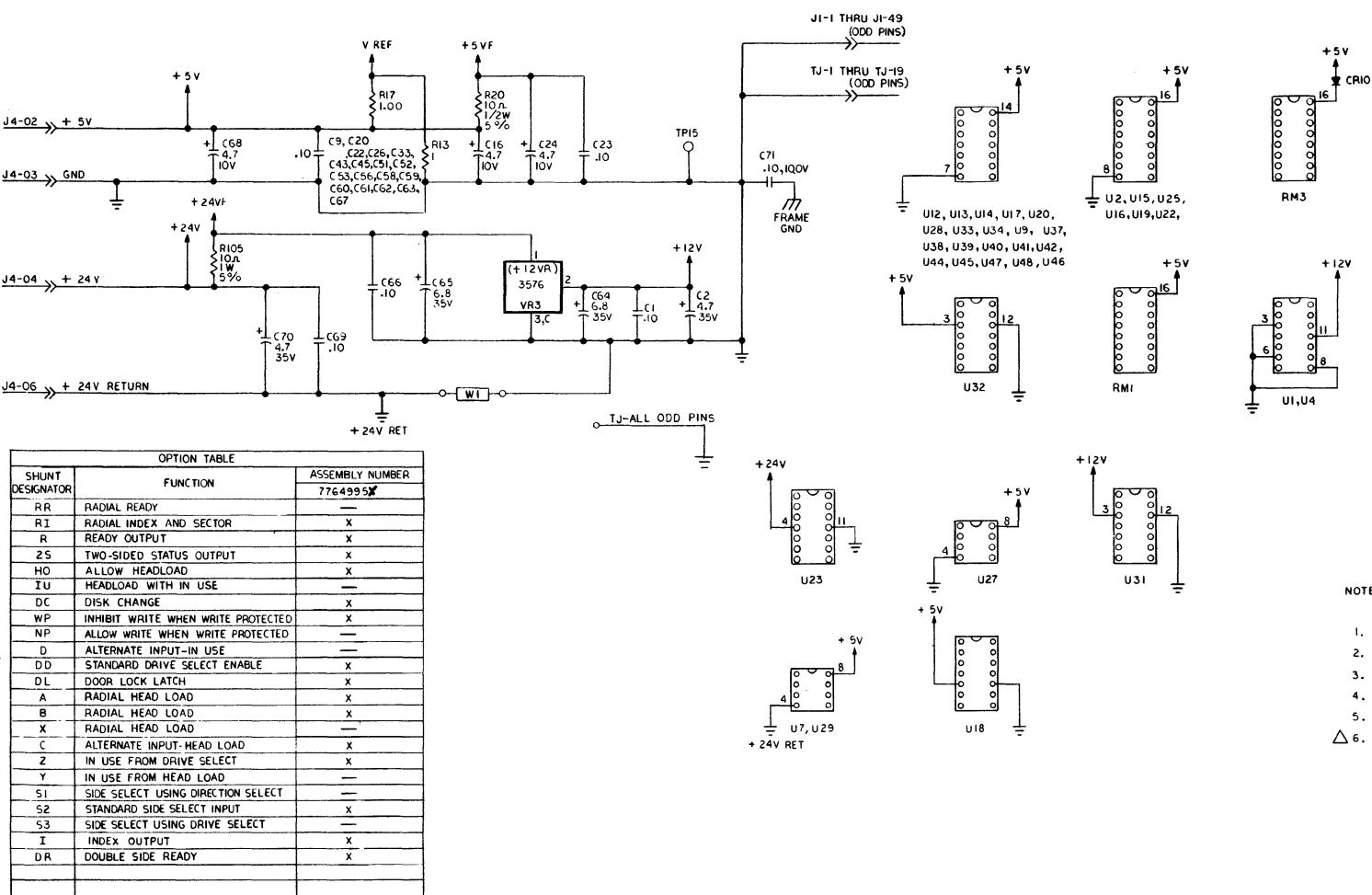


FIGURE 5-4. ASSEMBLY, INTERFACE AND DC POWER MATING CONNECTORS (UNIVERSAL CONFIGURATION)

FIGURE 5-3A. SCHEMATICS (SHEET 1 OF 5)
(SOFT-SECTOR CONFIGURATION)

NOTES:

UNLESS OTHERWISE SPECIFIED:

1. ALL RESISTOR VALUES ARE IN K OHMS, 1/4 W, 10%.
2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. ALL DIODE PACKS ARE D1C16 (U24, U26)
4. ALL TRANSISTOR PACKS ARE Q2T2905 (U36)
5. ALL DIODES ARE IN4001
6. IF REQUIRED, VALUE IS DETERMINED BY CUSTOMER REQUIREMENT

FIGURE 5-3. SCHEMATICS (SHEET 2 OF 5)
(SOFT-SECTOR CONFIGURATION)

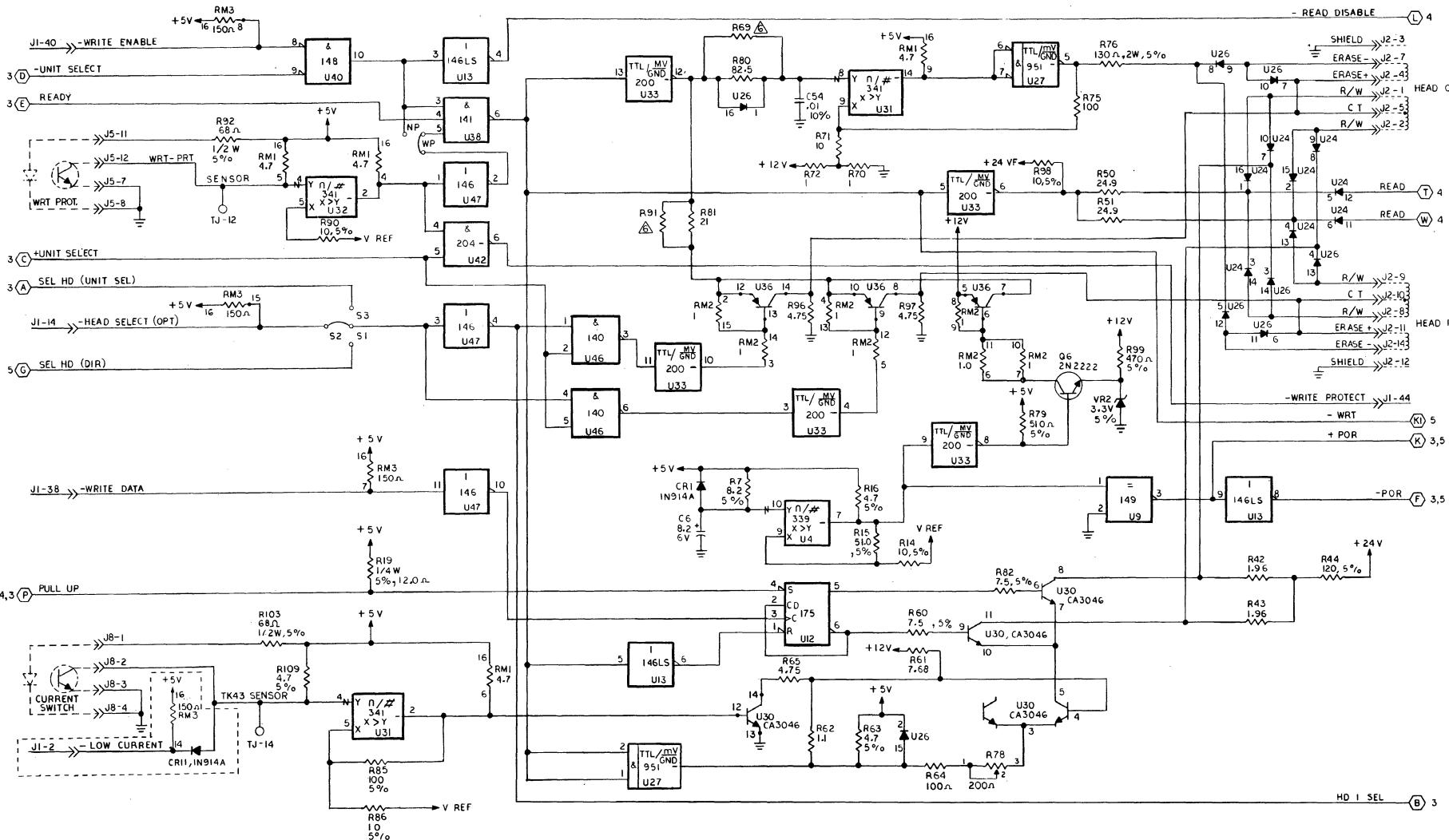
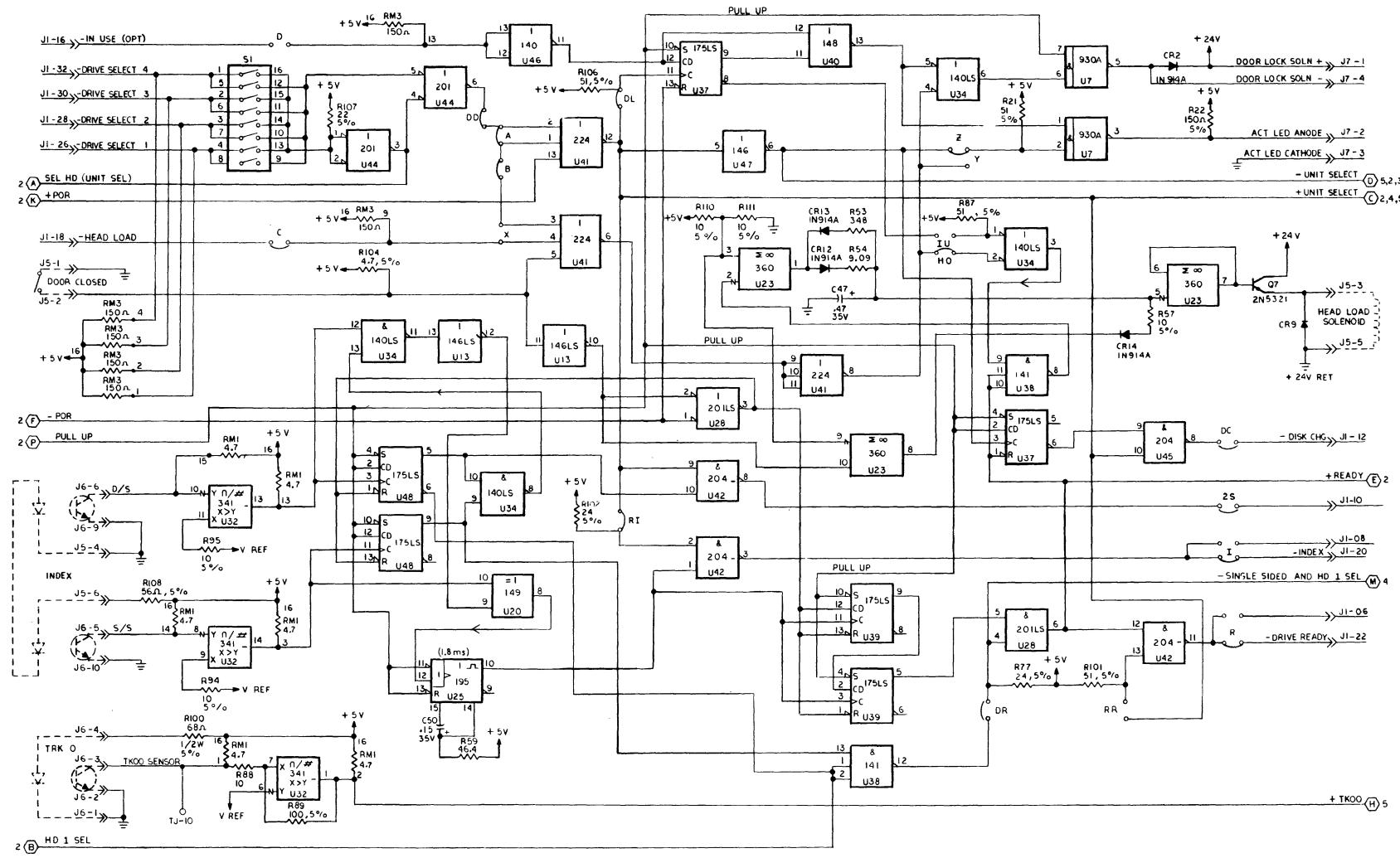
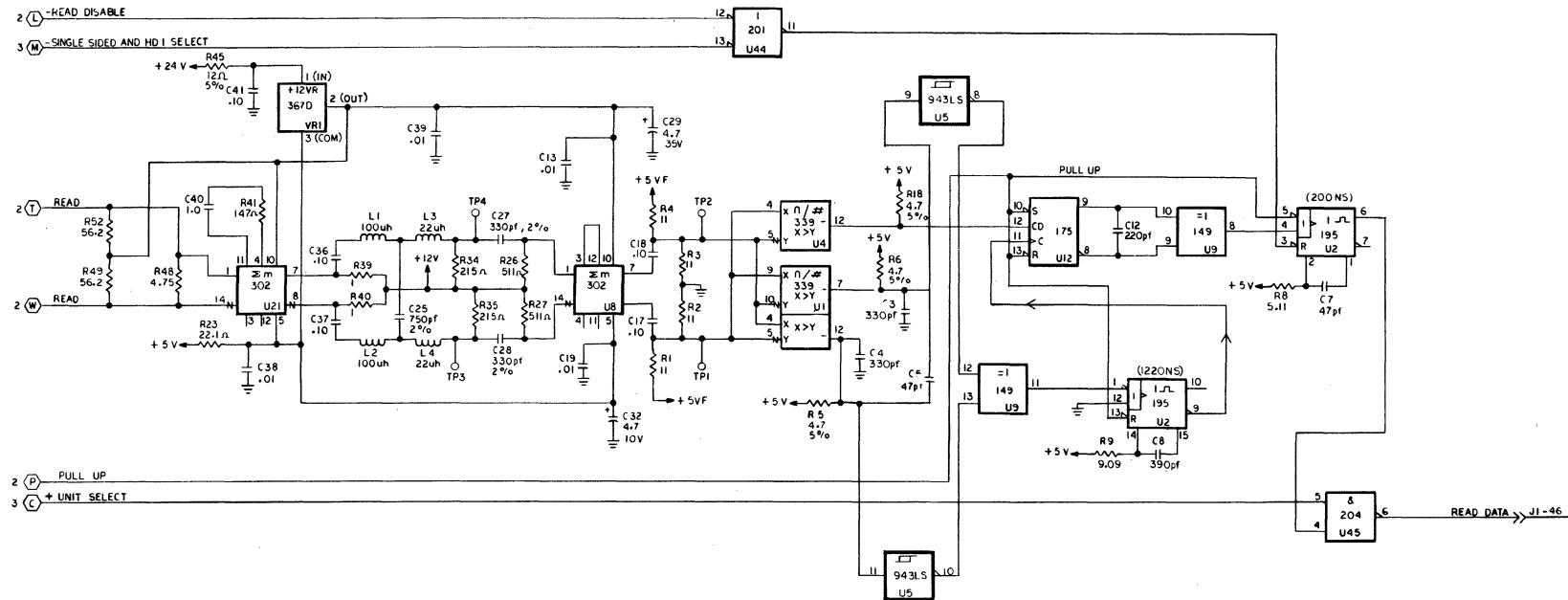


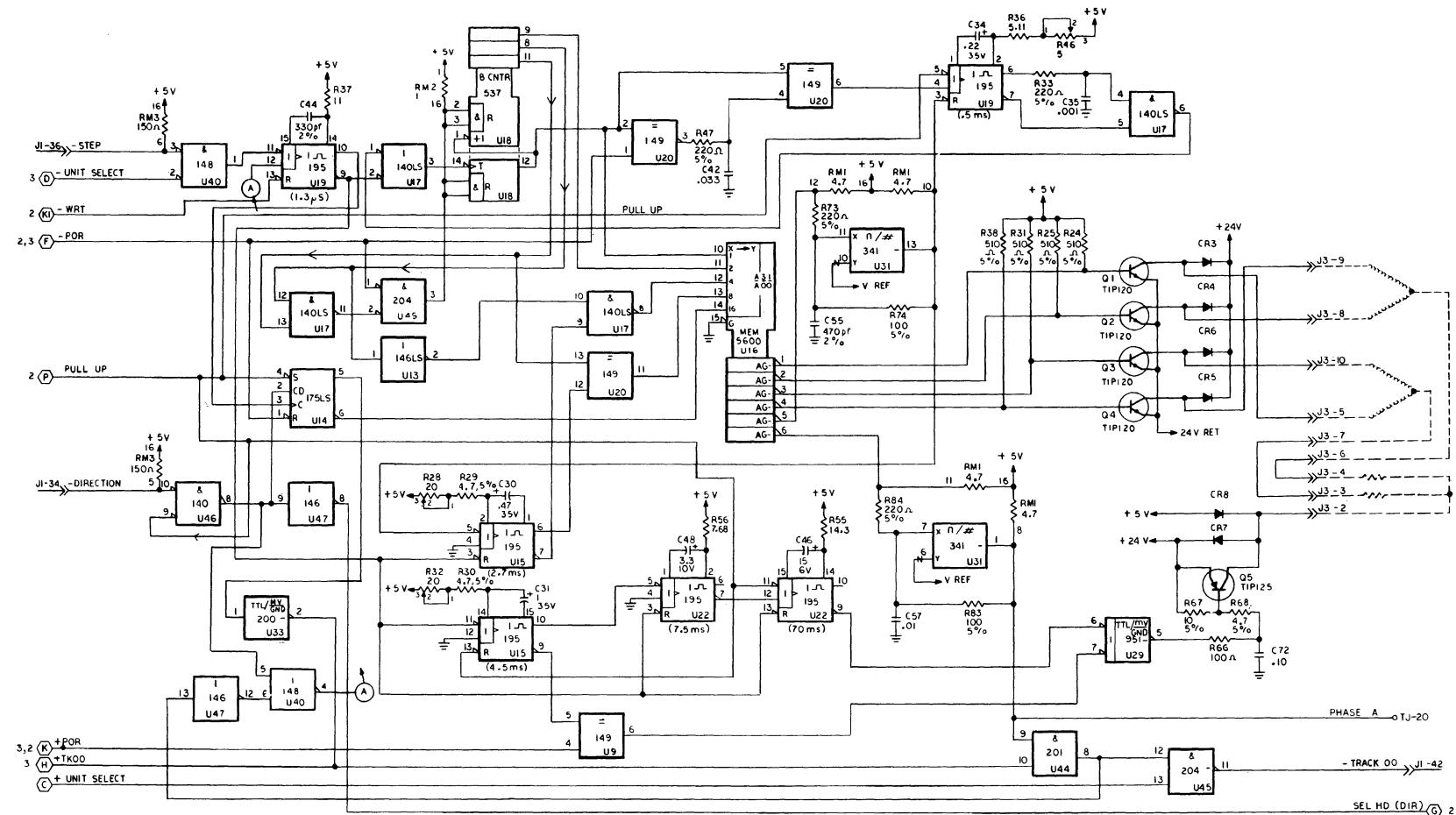
FIGURE 5-3A. SCHEMATICS (SHEET 3 OF 5)
(SOFT-SECTOR CONFIGURATION)



**FIGURE 5-3A. SCHEMATICS (SHEET 4 OF 5)
(SOFT-SECTOR CONFIGURATION)**



**FIGURE 5-3A. SCHEMATICS (SHEET 5 OF 5)
(SOFT-SECTOR CONFIGURATION)**



6.1 INTRODUCTION

This section contains the instructions required to maintain the FDD. The information is provided in the form of preventive maintenance, troubleshooting and corrective maintenance.

6.2 MAINTENANCE TOOLS

The Special tools (or equivalent) required to maintain an FDD are as follows:

<u>DESCRIPTION</u>	<u>CDC MODEL NO.</u>
Alignment Diskette (Single-Side, Optional)	421-51W
Alignment Diskette (Two-Sided)	425-51W

6.3 TROUBLESHOOTING

An improperly adjusted FDD may exhibit symptoms of one that has a malfunction; therefore, the Adjustment Procedures (paragraph 6.4) should be performed before assuming that the drive has failed.

TABLE 6-1. ADJUSTMENT REFERENCE

<u>Adjustment Paragraph No.</u>	<u>Adjustment Identification</u>
6.4.1	Write-Splice Check and Adjustment
6.4.2	Actuator Alignment (Diskette)
6.4.3	Clamshell-Closed Switch Adjustment
6.4.4	Track 00 Optical Sensor Adjustment
6.4.5	Diskette Ejector Adjustment
6.4.6	Diskette Load-Pad Adjustment
6.4.7	Head-Unload Clearance Adjustment
6.4.8	Band Alignment
6.4.9	Low-Current-Switch Optical-Sensor Adjustment

6.3.1 DC VOLTAGE AND SIGNAL CHECK

- a. Input power should be +5VDC $\pm 5\%$ and +24VDC $\pm 10\%$ measured at the input to the FDD (refer to paragraph 3.4.2).
- b. Test Points: The signals at the test points should conform to the various diagrams and waveforms as listed in Table 6-2*.
- c. Signals should conform to Figure 5-1 and Figure 6-1 through 6-4.

TABLE 6-2. TEST POINTS

Test Point No.	Refer to Fig. No.	Comments
TJ-14		Low-Current-Switch Detector
1	5-2	Differentiated Analog
2	5-2	Read Data (Differential)
3	5-2, 6-2, 6-3	Analog Read Data
4	5-2, 6-2, 6-3	(Differential)
TJ-16	5-2, 6-4	Write flip flop
TJ-8	---	3/4-Cell One-Shot
U19-9	5-2	Stepper One-Shot
8 U2-6	5-2	-Read Data
TJ-2	5-2	Stepper Steering Logic
TJ-6	5-2	Stepper Steering Logic
TJ-10	---	Track 0 Detector
TJ-12	---	Write Protect Detector
U25-7	5-2	Sector One-Shot
U20-8	5-2	Index/Sector
15		Ground

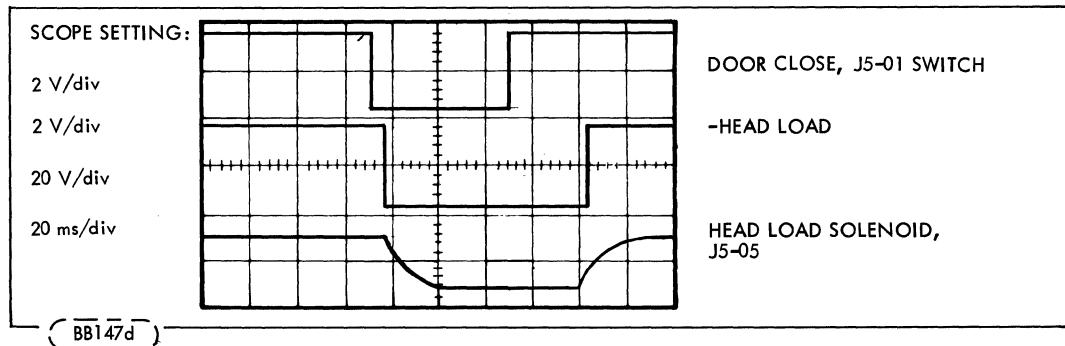


FIGURE 6-1. -HEAD-LOAD AND DOOR-CLOSE SWITCH

*Test Points not called out in Table 6-2 may not be applicable to field use.

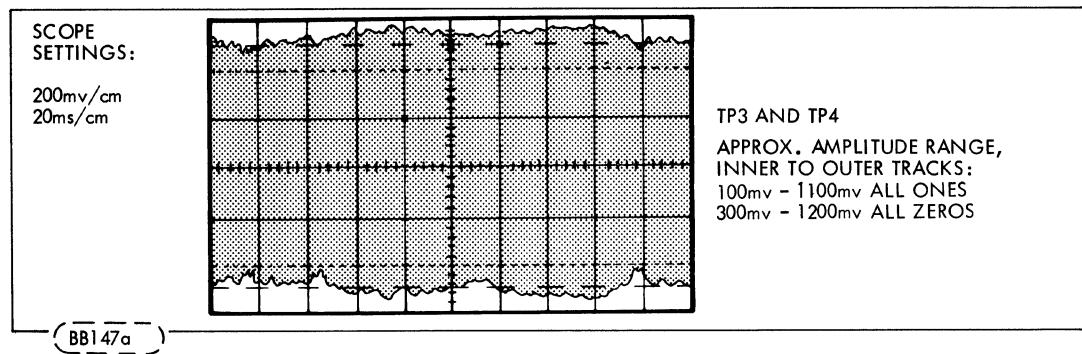


FIGURE 6-2. DIFFERENTIAL READ SIGNAL FOR ENTIRE TRACK

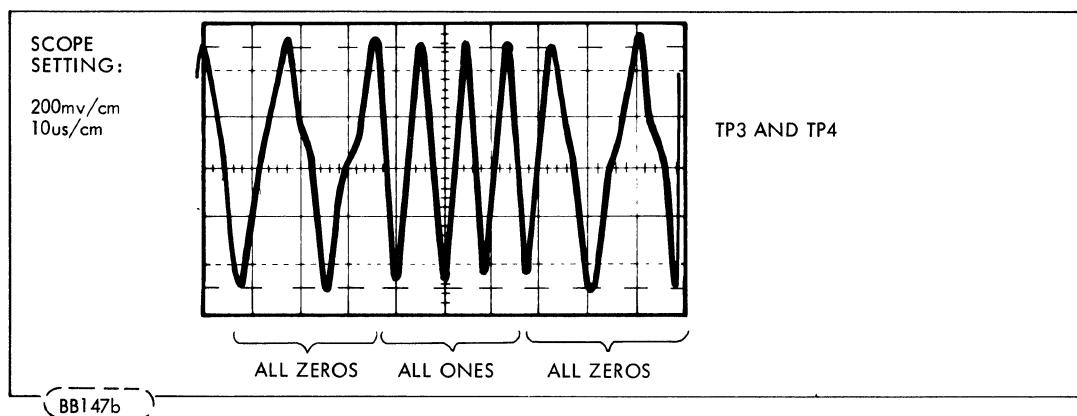


FIGURE 6-3. DIFFERENTIAL READ SIGNAL FOR PORTION OF OUTER TRACK

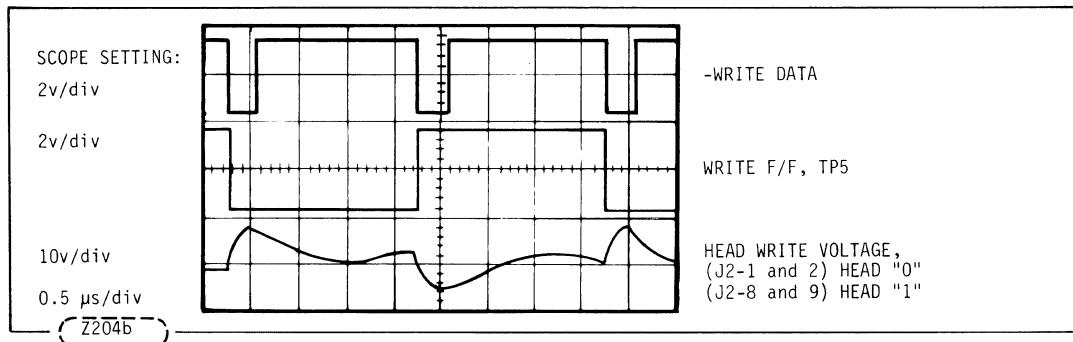


FIGURE 6-4. WRITE DATA, WRITE F/F OUTPUT, AND HEAD WRITE VOLTAGE FOR OUTER TRACK

6.4 ADJUSTMENT PROCEDURES

6.4.1 WRITE-SPICE CHECK AND ADJUSTMENT

Alignment Diskette 421-51W and 425-51W are used to perform this procedure.

- a. Precondition the alignment diskette by allowing it to reach room temperature for one hour.
- b. Install the alignment diskette.

CAUTION

The Alignment Diskette is for read only. Extreme caution should be used to assure this diskette is not written on.

- c. Seek to Track 00, then seek to Track 01 and Read on head 0. (No data is recorded on Track 1.)
- d. Connect Channel 2 of scope to TP3 on the PWA, Channel 1 to Index J1-20 of the PWA. Set up the scope as follows:

Chan 2 Volt/Div to: 0.1 volt/div
Chan 1 Volt/Div to: 2 volt/div

Vert. Mode to: Add Trig. Mode to: Channel 1
Slope (Sync) to: Pos Time Base to: 50 μ s/div

- e. Adjust the time of the write-splice bit until it measures per $200 \mu\text{s} \pm 100 \mu\text{s}$. Refer to Figure 6-5a to adjust the time, loosen the single-sided sensor set screw holding the (single-sided-sensor) phototransistor located on the bottom of the chassis toward the front of the unit, (Figure 6-5b). Using the adjustment tab protruding through the casting, move the phototransistor until the specification is met. Tighten the set screw while observing the scope signal. Verify that the adjustment did not change.
- f. All scope settings are to remain as defined in the original setup in Step d, but it may be necessary to slightly adjust the sync. Seek to Track 00 then seek to Track 01 and perform a read. While observing the signal on the scope, remove and reinsert the diskette three times.

After each insertion, verify that the change in the time from Index to write splice is less than 50 μ s.

Repeat Steps b through f using Alignment Diskette 425-51W for the two-sided sensor adjustment tab and its associated set screw, as required.

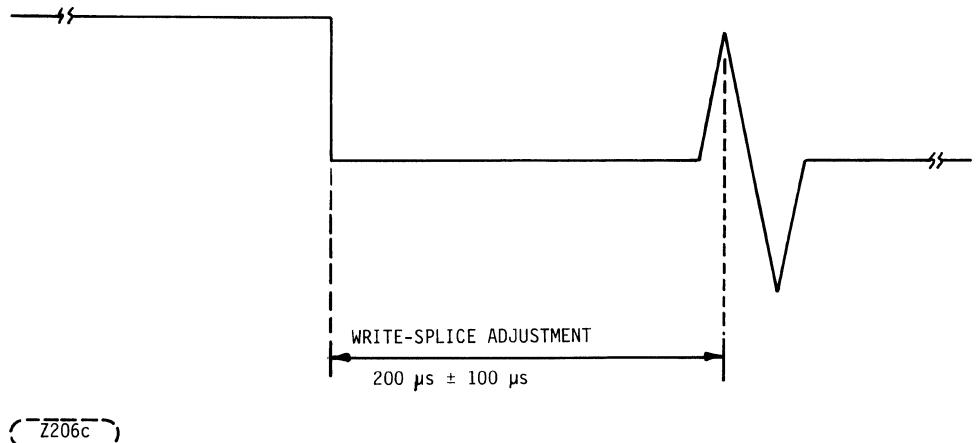


FIGURE 6-5A. WRITE-SPICE-TIMING

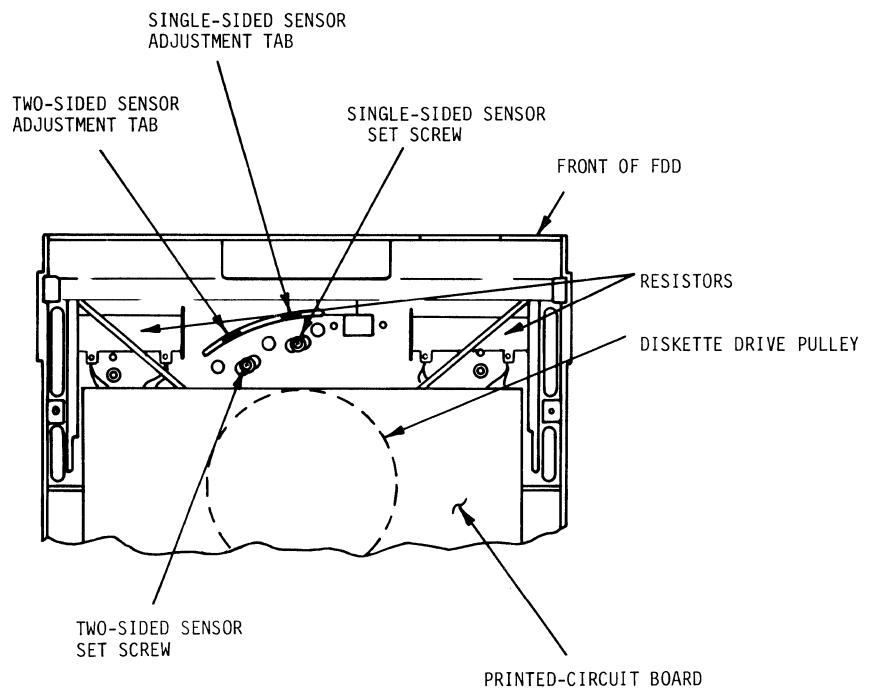


FIGURE 6-5B. SINGLE-AND TWO-SIDED SENSOR ADJUSTMENT MEANS

6.4.2 ACTUATOR ALIGNMENT

- a. The alignment diskette shall be preconditioned by allowing it to reach room temperature for one hour.
- b. Install the alignment diskette.

CAUTION

The alignment diskette is for read only.
Extreme caution should be used to assure
this diskette is not written on.

- c. Step to Track 38 (00100110) and perform a read on head 0. (No data is recorded on Track 38. The tester or system requirements should be noted; refer to tester or system instructions for operation).
- d. Connect Channel 1 of scope to TP3 on the PWA and Channel 2 to TP4 on the PWA.
- e. Connect the external sync probe to index at J1-20 on PWA.

f. Set up the scope as follows:

Channel 1: volts/div to: 0.1 volts/div
Channel 2: volts/div to: 0.1 volts/div (inverted)
Channel 1: input to: AC
Channel 2: inputs to: AC

Vertical Mode to: Add
Slope (Sync) to: Negative
Trigger Source to: External
Trigger Coupling to: Low Frequency (High Frequency Reject)
Trigger Mode to: Normal
Time Base to: 20 ms/div

NOTE

Scope trace after trigger level is adjusted for repetitive trace should display an envelope of data "Cateyes" consisting of two lobes (refer to Figure 6-6).

g. Change the volts/div of Channel 1 and Channel 2 to 0.02 volts/div. For an acceptably aligned unit, the voltage ratio of the smaller lobe to the larger lobe should exceed 80%.

h. If not in alignment, loosen the stepper-motor-adapter mounting screws and slowly rotate the stepper motor to adjust the amplitude until the amplitude of both lobes is the same. Small increments of motion can be easily achieved by placing the blade of a flat-blade screwdriver against the adapter main wall at the locations shown in Figure 6-11, and then tapping lightly on the screwdriver handle.

CAUTION
Do not tap against the motor.

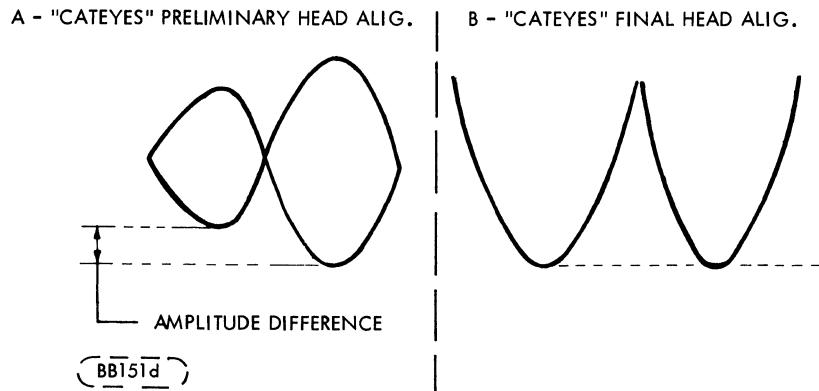


FIGURE 6-6. HEAD-ALIGNMENT AMPLITUDE

- i. Tighten the stepper-motor adapter screws. Return to Track 00, then seek back to Track 38. Verify the adjustment. If the specification is not met, readjust the stepper motor, return to zero and seek back to Track 38. Repeat the adjustment until the specification is met.
- j. Remove alignment diskette.
- k. Perform Track 00 adjustment, paragraph 6.4.4.

6.4.3 CLAMSHELL-CLOSED SWITCH ADJUSTMENT

Close the clamshell and check that it is latched. Turn the setscrew clockwise until the switch makes contact. Turn the setscrew one additional turn and a half. Open and close the clamshell several times while observing the door-closed signal.

6.4.4 TRACK 00 OPTICAL SENSOR ADJUSTMENT

Adjust the Track 00 optical sensor for the output in Figure 6-7 while the FDD alternately seeks at 3 ms ± 0.1 ms per step between Track 00 and Track 03.

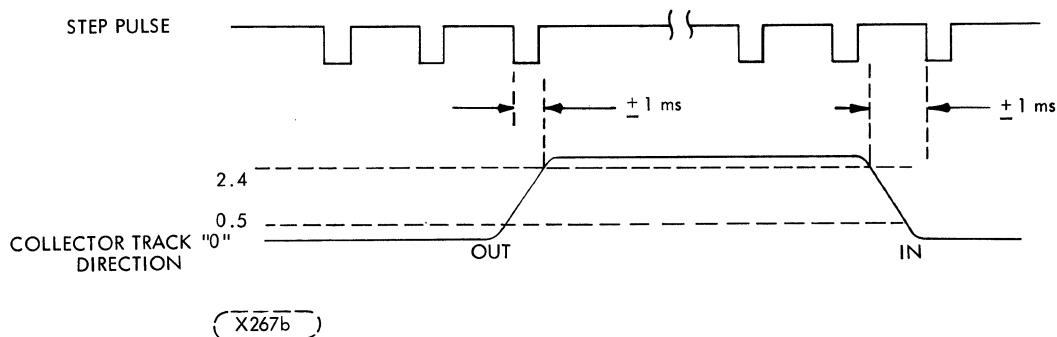


FIGURE 6-7. TRACK 00 OPTICAL SENSOR OUTPUT

6.4.5 DISKETTE EJECTOR

Insert a diskette fully and note a clicking noise as the ejector engages a pin on the clamshell.

While observing the ejector, latch and latch block (Figure 6-8 through the 1/2 in. (12.7 mm) hole in the sidewall, close the clamshell. Note that closing the clamshell moved the ejector further to the rear allowing the latch to rotate counterclockwise until the tip drops over the step in the latch block.

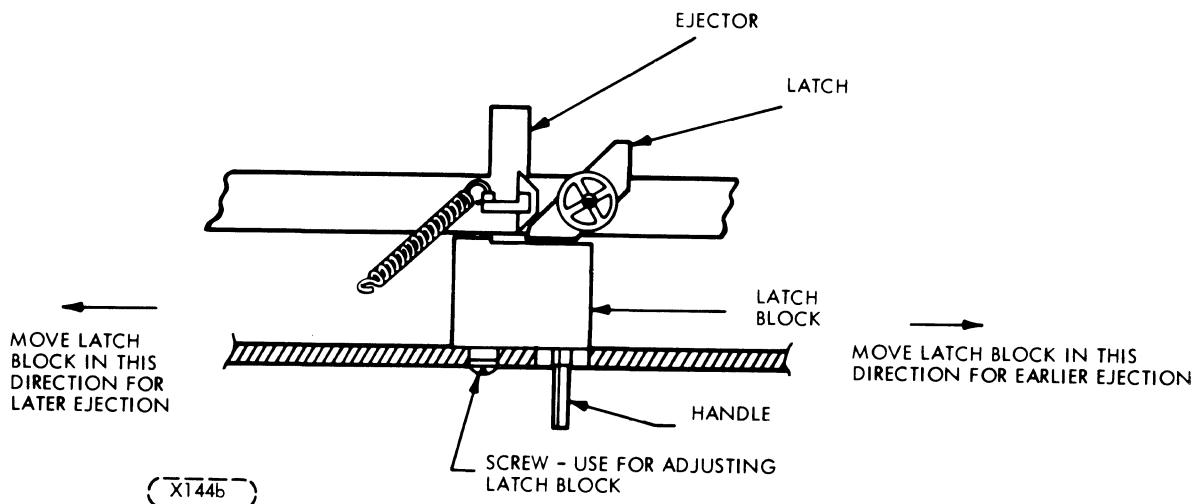


FIGURE 6-8. EJECTOR, LATCH AND LATCH BLOCK

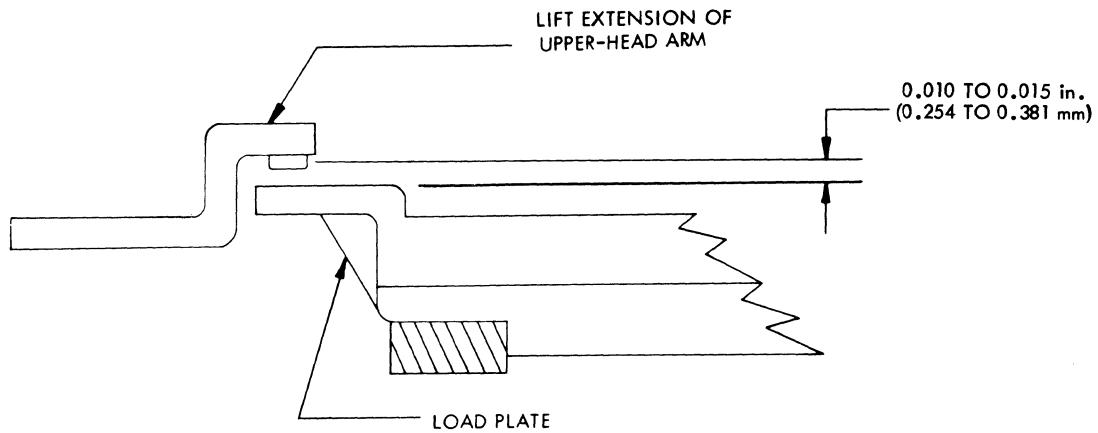
With the clamshell closed, adjust the latch block (Figure 6-8) so the tip of the latch just clears the step.

Check by opening the clamshell slowly and observing the clamshell position when the diskette is ejected. To avoid damage, it is to be ejected when the clamshell is 1/4 in. (6.35 mm) max. from the fully opened position. If further adjustment is required, move the latch block as indicated by the arrows and instruction in Figure 6-8.

Operate several times and observe that the diskette ejection is within the 1/4 in. (6.35 mm) max. described above.

6.4.6 DISKETTE-LOAD-PAD ADJUSTMENT

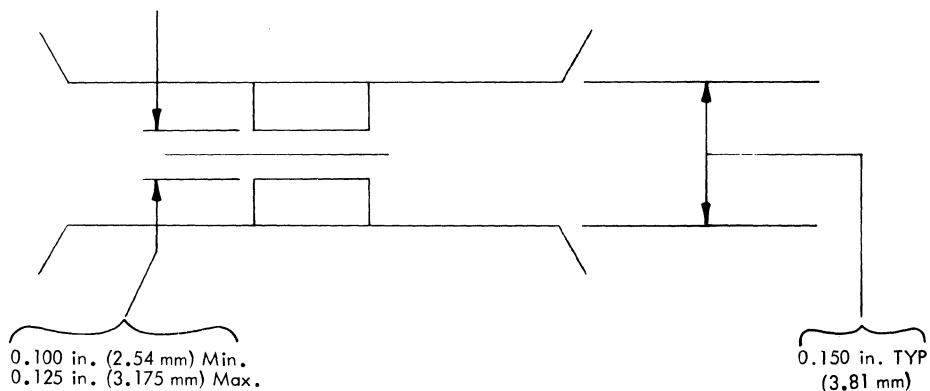
- a. Refer to Figure 6-9.
- b. Energize Solenoid
- c. Loosen Solenoid mounting screws (2x).
- d. Move solenoid down on bracket to obtain a clearance of 0.010 to 0.015 in. (0.254 to 0.381 mm) between the load plate and the lift extension of the upper-head arm at the location of minimum clearance. Move the carriage through its full travel manually to determine the location of minimum clearance.



(X267a) FIGURE 6-9. LOAD PAD ADJUSTMENT

6.4.7. HEAD-UNLOAD CLEARANCE

Adjust set screw on clamshell for 0.100 in. to 0.125 in. (2.54 to 3.175 mm) clearance per Figure 6-10 between flyer pads with head-load solenoid de-energized and clamshell closed.



(X267d) FIGURE 6-10. HEAD UNLOAD CLEARANCE AS VIEWED FROM THE FRONT OF THE CARRIAGE

CAUTION

Do not use gauge for this adjustment. Estimate spacing by viewing with an inspection mirror.

6.4.8 BAND ALIGNMENT

Referring to Figure 6-12:

- a. Attach band to carriage.
- b. Loosen clamp screws on pulley, access through adapter slot.
- c. Tension band and tighten idler mounting plate.
- d. Move carriage by hand (full travel) several times to allow band to align.
- e. Tighten pulley clamp screws.

- f. Move carriage to check band alignment. Check for band kink near carriage mount over full range of carriage traverse.
- g. Repeat procedure to eliminate kinking.
- h. Perform 6.4.2.

CAUTION

Band edge is sharp.

6.4.9 LOW-CURRENT-SWITCH OPTICAL-SENSOR ADJUSTMENT

Verify adjustments 6.4.1 and 6.4.4 before beginning this adjustment.

Adjust the Low-Current-Switch optical sensor (on top Track "0" optical sensor) for the proper output when positioned between tracks 42 or less and track 43 or greater.

- a. Set up the scope as follows:

Channel Probe: TJ-14 or J8-2
Channel 1: volts/div to 1 V/div (0.1 V/div for X 10 probe)
Channel 1: input to DC
Vertical Mode to: Channel 1
Scope (sync) to: Positive
Trigger Source to: Internal
Trigger Coupling to: DC
Trigger Mode to: Auto
Time Base to: 20 ms/div

- b. Perform a seek to track 42.
- c. Adjust the optical sensor for +2.4 V min.
- d. Perform a seek to track 43.
- e. Verify the scope reads +0.5 V max.
- f. Repeat b, c and d if necessary until the DC levels in c and e are met.

6.4.10 TRACK-ZERO STOP ADJUSTMENT

With the optical Track 00 sensor adjusted as detailed in paragraph 6.4.4 and the carriage located at track zero, adjust the track zero stop screw for 0.015 ± 0.005 in. (0.381 ± 0.127 mm) clearance between the rear of the carriage and the tip of the stop screw.

6.5 REMOVAL AND REPLACEMENT PROCEDURES

The following procedures give the proper sequence for removal and replacement of major assemblies. To avoid damage to parts, the procedure must be performed in sequence.

6.5.1 PRINTED-CIRCUIT BOARD (PWA)

- a. Disconnect I/O Cable from J1 (refer to Figure 5-3).
- b. Disconnect harnesses from connectors on printed-circuit board.
- c. Remove screw from printed-circuit board adjacent to connector J1.
- d. Remove PWA by detaching it from the four push-in clips.
- e. To replace printed-circuit board, push clips through printed-circuit board.
- f. Replace screw adjacent to connector J1.
- g. Reconnect harness and I/O cable.
- h. Set dipswitch S1.
- i. Perform write-splice check and adjust as necessary (par. 6.4.1).

6.5.2 HEAD REPLACEMENT

Referring to Figures 6-11 and 6-12.

- a. Remove clamshell;
- b. Disconnect head cables;
- c. Loosen tension on idler;
- d. Remove band retainer from carriage;
- e. Remove band from carriage;

CAUTION

Band has sharp edges; don't kink or bend.

- f. Remove cable guide;
- g. Remove cable clamp;
- h. Lift ejector mechanism to remove head cables from channel;
- i. Remove clamp screws from carriage guide bar;
- j. Slide carriage to rear to clear idler assembly and remove. Care must be taken to prevent head assemblies from snapping together.
- k. Remove guide bar from carriage;
- l. Reverse procedure to install new carriage. Care must be taken to get swing-arm lift tab above head-load plate.
- m. Tighten screws on guide rod;
- n. Route cable through ejector channel and install cable wire guide;
- o. Thread cables through chassis and connect to circuit board;
- p. Install cable clamp; go to 6.4.8, Band Alignment, and perform Steps a through h;
- q. Install clamshell;
- r. Check 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.4.5, 6.4.6, 6.4.7 and 6.4.9.

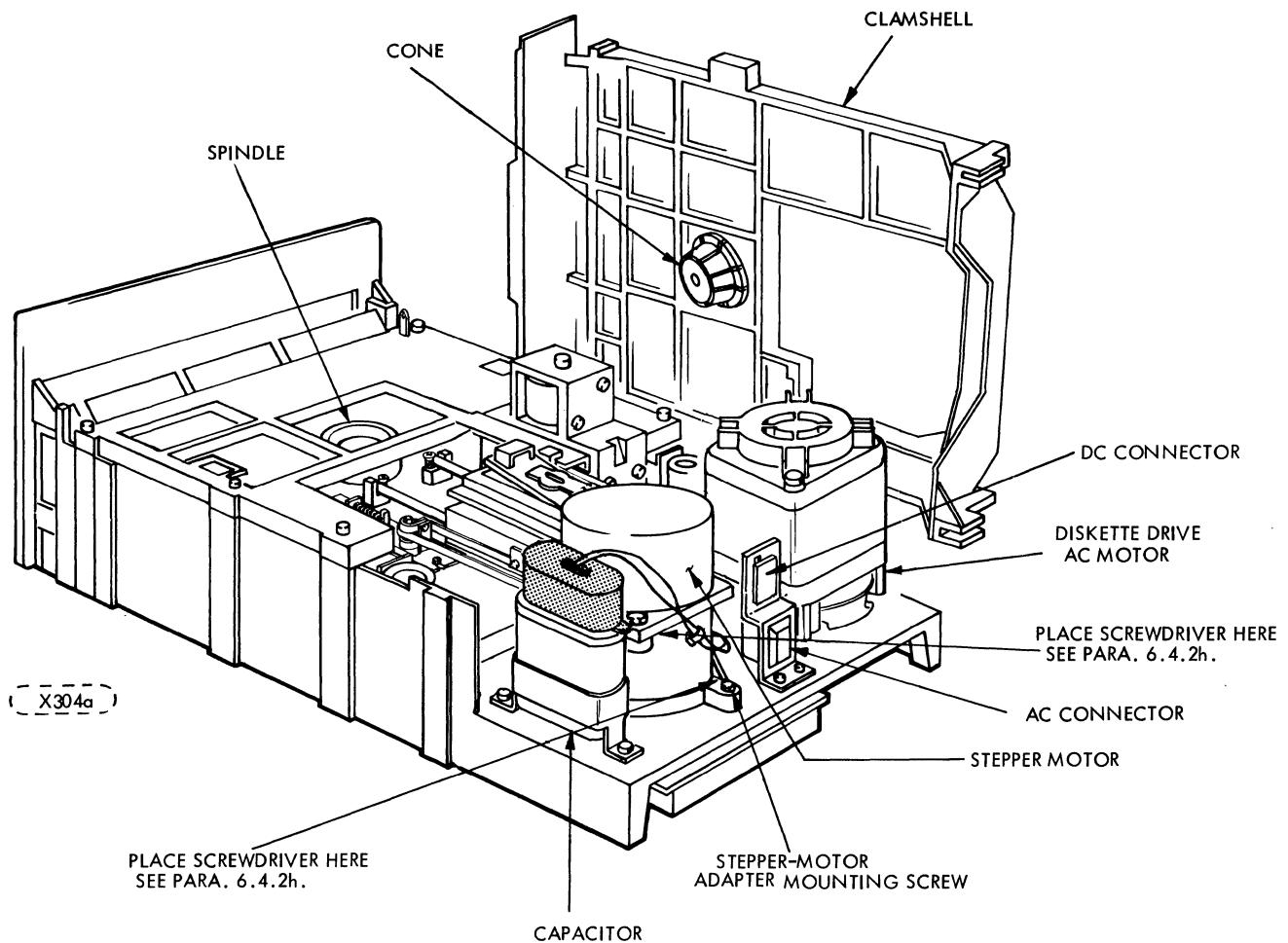
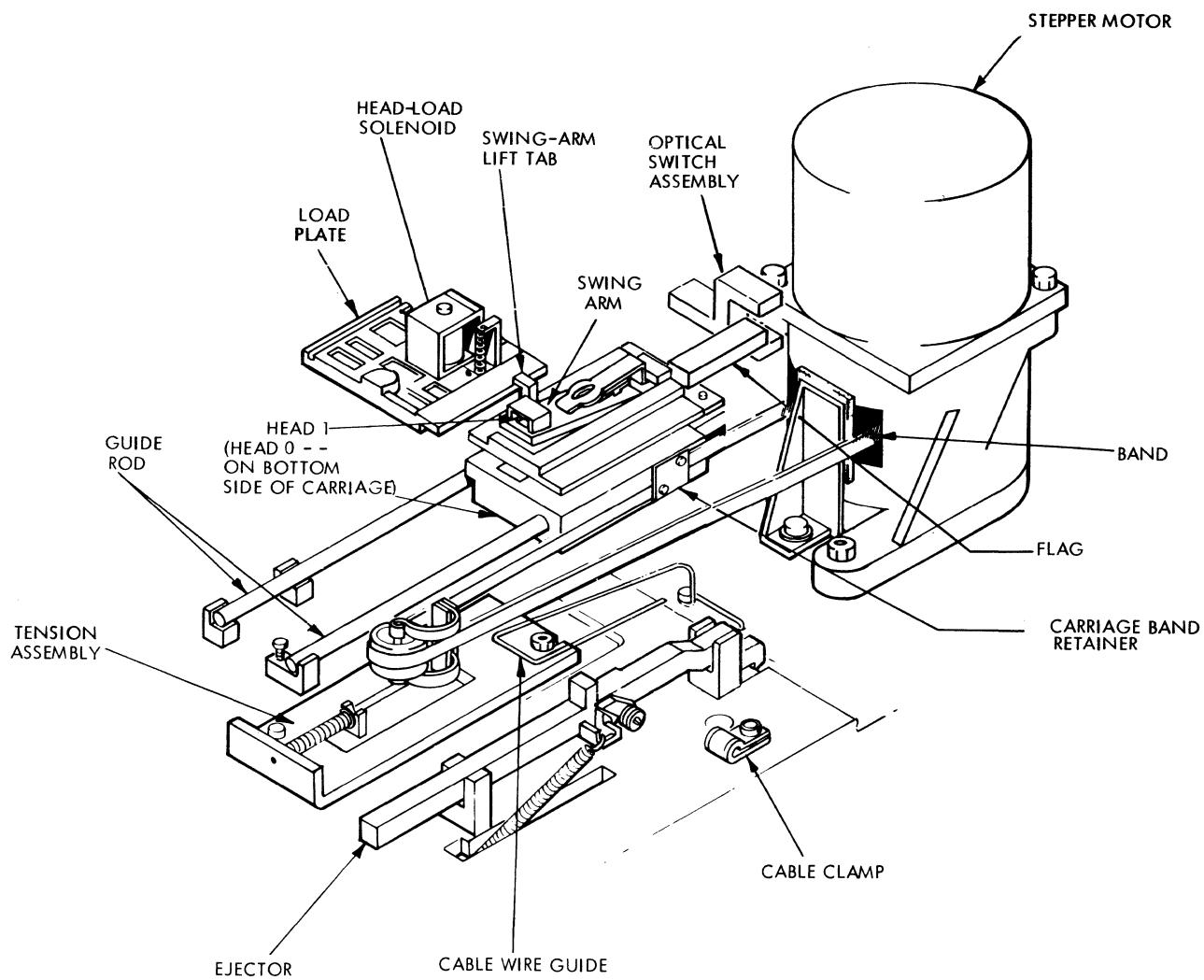


FIGURE 6-11. POSITIONING AND HEAD-LOAD MECHANISM,
CLAMSHELL COVER RAISED



(Z208a)

FIGURE 6-12. HEAD-LOAD CARRIAGE AND STEPPER MOTOR DETAILS

6.5.3 DRIVE MOTOR ASSEMBLY

- a. Perform removal procedure for printed-circuit board (paragraph 6.5.1).
- b. Remove screws securing drive-motor cable clamps.
- c. Remove AC connector from bracket.
- d. Remove spindle drive belt.
- e. Remove three (3) nuts or screws securing drive motor.
- f. Remove drive-motor assembly (drive motor, capacitor, and AC connector).
- g. To replace drive-motor assembly perform in reverse steps f through a.

6.5.4 ACTUATOR REPLACEMENT

- a. Perform Steps a through e of paragraph 6.5.2
- b. Remove pins J3-04, 03 and 02.
- c. Loosen bottom 2 screws and remove stepper motor band.
- d. Reverse the above procedure to reassemble stepper motor and band drive to unit.
Perform paragraphs 6.4.1 through 6.4.9.

6.6 FREQUENCY CONVERSION

6.6.1 OPERATING FREQUENCIES CONVERSION PROCEDURE

This procedure is to be used to convert the FDD unit from 60 Hz operation to 50 Hz operation, or vice versa. This is accomplished by reversing the dual-diameter reversible pulley on the spindle-motor shaft using the following steps:

- a. Remove AC power.
- b. Remove printed-circuit board assembly per paragraph 6.5.1.
- c. Remove the belt from the spindle-motor pulley. (Accessible from the under side of unit.)
- d. Loosen setscrew and remove pulley.
- e. Reverse pulley and replace on motor shaft.

- f. Position pulley allowing tolerance of 0.039 in. (0.99mm) ± 0.10 in. (0.254 mm) between shoulder of motor mounting screws and pulley (Figure 6-13).
- g. Tighten down setscrew.
- h. Replace belt and printed-circuit board.

CAUTION

It is IMPORTANT that the new operating frequency be marked on the unit's rating nameplate.

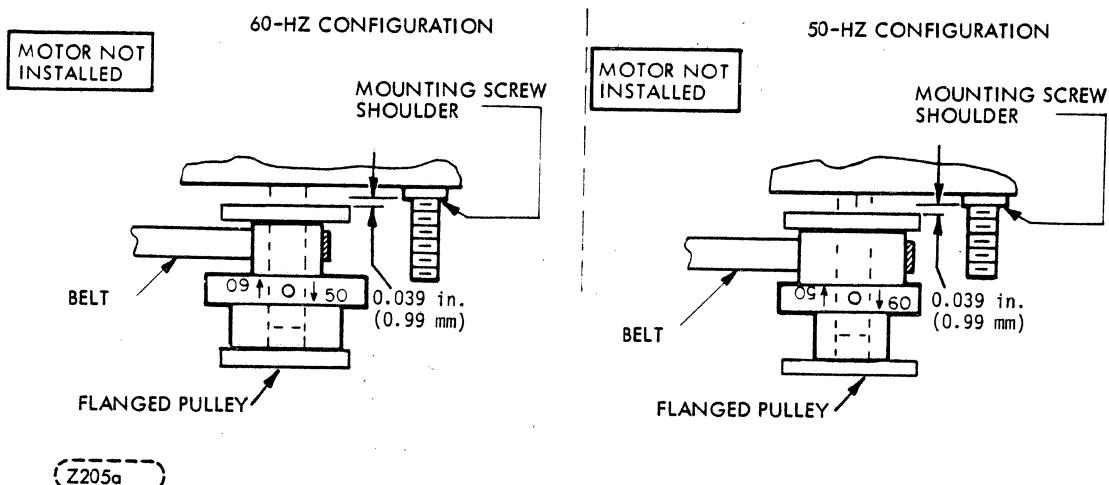


FIGURE 6-13. DRIVE-PULLEY REVERSAL

NOTE: When converting from 60 Hz to 50 Hz, the same belt may be used. When converting from 50 Hz to 60 Hz, a new belt must be installed.

7.1 INTRODUCTION

This section contains detailed information on the logic circuits used in the FDD. The logic consists of two types of circuits: discrete component and integrated circuits (IC). Integrated circuits are contained within a single chip and discrete component circuits contain individually identifiable resistors, capacitors, transistors, etc.

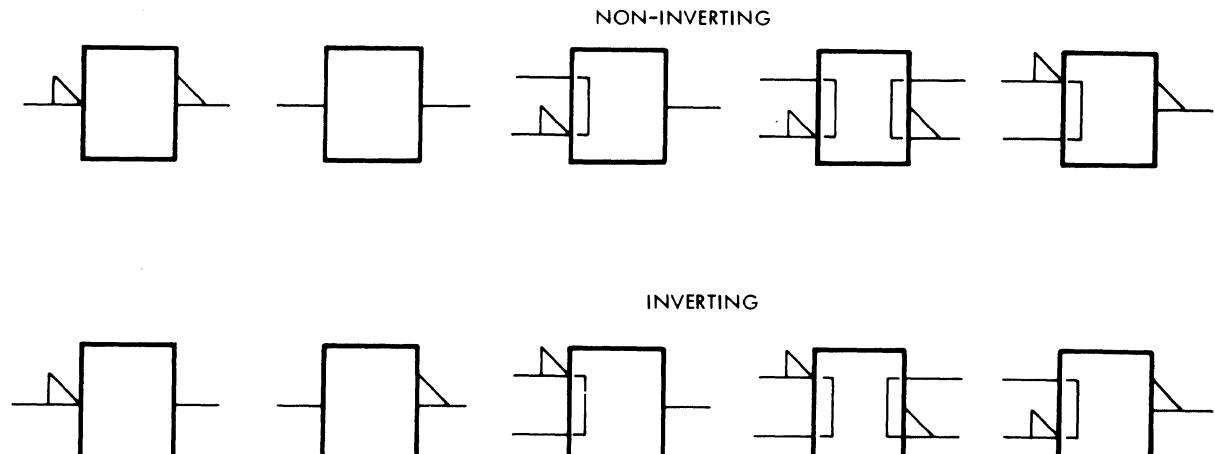
7.2 PHYSICAL DESCRIPTION (LOGIC)

All components are mounted on one side of the printed circuit board. The board is 6.75 X 11 inches (171 mm X 279. 4 mm) and contain both IC and discrete component circuits.

7.3 USE OF RELATIVE LEVEL INDICATORS

The relative level indicator is a small triangle located on the input or output to a logic block. The presence or absence of this indicator indicates the conditions that are necessary to satisfy the function of the logic block. The presence of the triangle indicates a 0 logic level on that line is needed to satisfy the function. The absence of the triangle indicates a logical 1 is needed to satisfy the function.

The relative level indicator depicts the occurrence of inversion. Figure 7-1 shows some representative examples of the relative level indicator being used in this manner.



1- AA042f

FIGURE 7-1. INVERSION CONVENTIONS

7.4 INTEGRATED CIRCUITS

Figure 7-2 shows an example of a schematic block and the information that it contains. The first line gives the function symbol which identifies the logic function that the block performs. Refer to Figure 7-3 for a summary of function symbols. The second line gives the CDC element number. The third line on the schematic block gives the circuit reference designation.

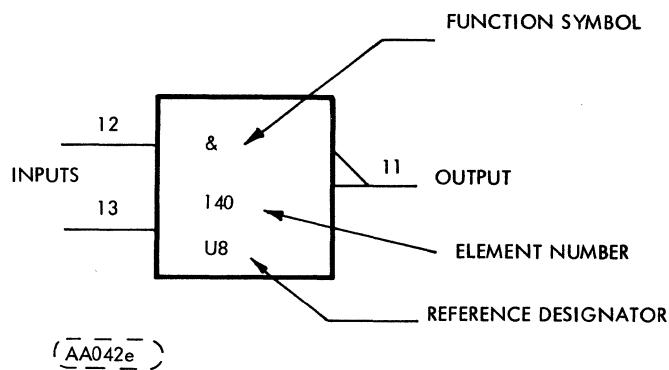


FIGURE 7-2. INTEGRATED CIRCUIT

FUNCTION SYMBOLS	
&	AND GATE OR INVERTER
1	OR GATE OR INVERTER
=1	EXCLUSIVE OR
1J	ONE SHOT
Σ	SUMMING CIRCUIT. NUMBER FOLLOWING (EXAMPLE 100) INDICATES GAIN OF 100
X/Y	LEVEL CONVERSION - TRANSMISSION LINE TO LOGIC LEVEL, SWITCH STATE TO LOGIC LEVEL OR LOGIC LEVEL TO POWER OUTPUT
<input checked="" type="checkbox"/>	SCHMITT TRIGGER (LOWER TRIP POINT ADJUSTABLE)
GENERAL SYMBOLS	
<u>—</u>	INDICATES NON STANDARD LOGIC LEVEL
<u>—X—</u>	INDICATES ANALOG SIGNAL
<u>—o—</u>	TEST POINTS
<u>— —</u>	INHIBITING INPUT

(BB151b)

FIGURE 7-3. SCHEMATIC SYMBOLS

PARTS DATA

8.1 INTRODUCTION

This section contains an illustrated parts breakdown that describes and illustrates all variations of the (band-driven) Model 9406 Flexible Disk Drive (FDD). In general, parts are in disassembly sequence but do not necessarily indicate the maximum recommended disassembly of parts in the field.

8.2 ILLUSTRATIONS

Item numbers within a circle ① indicate an assembly (group of parts). Item numbers without a circle, 1, indicate a single part; a group of parts that are pinned or press fitted together; or a group of parts which is normally replaced as an assembly.

8.3 PARTS LIST

In addition to the accompanying parts list on each illustration, two additional Parts Lists are available; the Top-Down Assembly/Component Parts List and the Cross Reference Index. Instruction for the use of all Parts Lists is given in para. 8.6.

8.4 PRODUCT CONFIGURATIONS

In conjunction with Table 8-1, Figure 8-1 serves two purposes;

1. When used with Table 8-1, it identifies all unique parts and assemblies for each FDD variation.
2. It identifies by sheet location where all major assemblies are broken down.

8.4.1 HARDWARE PRODUCT CONFIGURATOR (HPC)

To determine what parts are used on a particular model, find the applicable HPC number in Table 8-1. The item numbers at the top of Table 8-1 corresponds with the item numbers in Figure 8-1. All parts and assemblies that apply to the HPC number will be identified with an 'X' ('0' means not applicable). NOTE: The HPC Number is identical to the Equip. Idnet. No. shown on the label.

8.5 REPLACEMENT PARTS

When ordering replacement parts for the FDD, the inclusion of the following information for each part ordered will ensure positive identification:

1. Equip. Ident. No
2. Publication Number 75888344
3. Figure and Item Number
4. Identification Number and Description

NOTE:

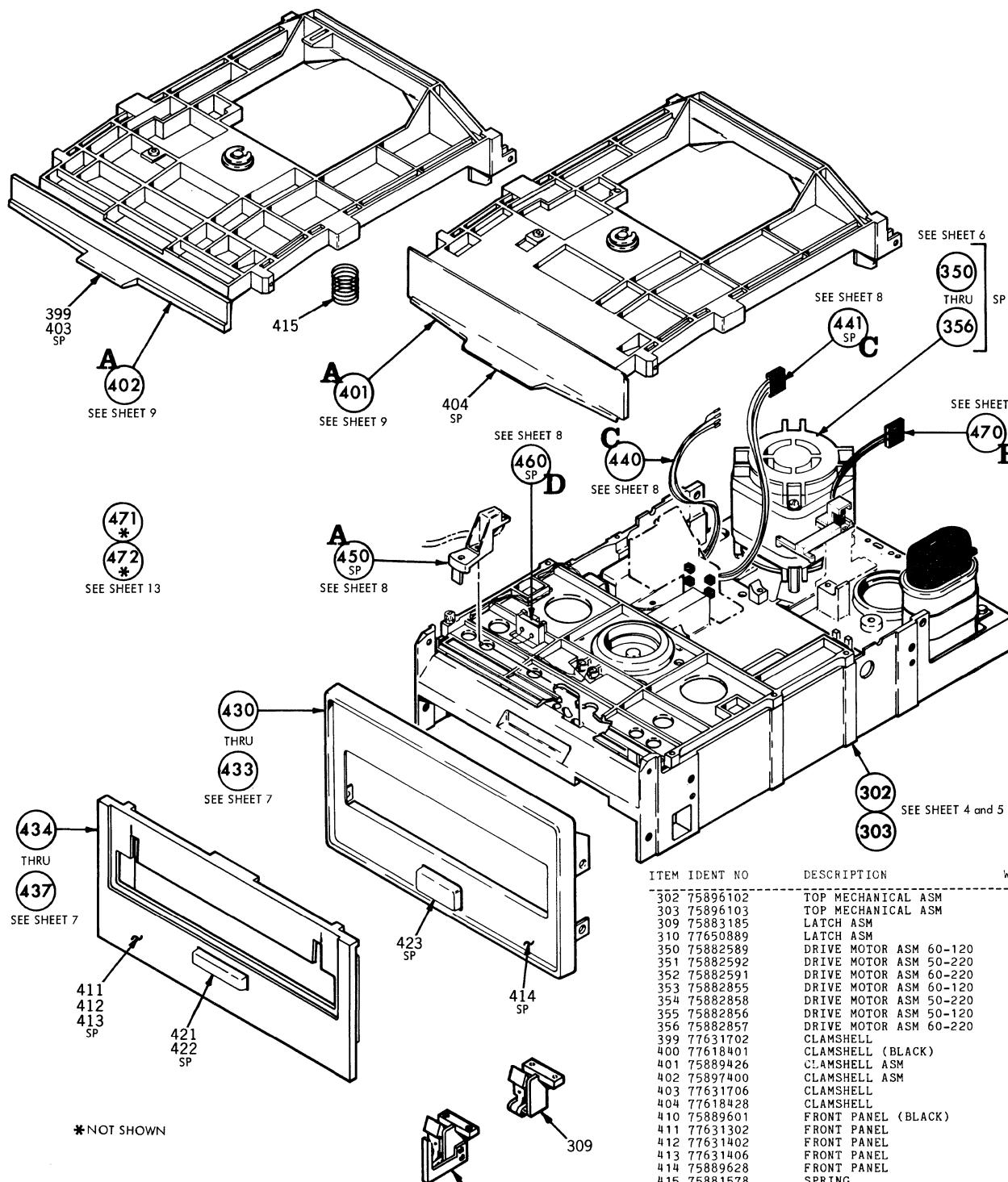
Before ordering parts however, refer to paragraph 8.5.1 Spare Parts.

8.5.1 SPARE PARTS

This Illustrated Parts Breakdown is complete to the extent that all parts and assemblies are depicted and identified. Replacement part availability depends on the materials and provisioning operation of the supplier.

To assist the service representative in selecting replacement parts with minimum requisitioning lead times, engineering recommended spare parts which reflect the intended service level of the device are identified with the letters SP adjacent to the item number on the face of each illustration. Replaceable non-spared items will require longer requisitioning lead times.

TABLE 8-1. PRODUCT CONFIGURATION



ITEM IDENT NO	DESCRIPTION	WHERE USED
460 75889979	DOOR INTERLOCK KIT	HPC
470 75883335	KIT, TK "43"	HPC
471 75883336	KIT, SIDE MTG	HPC
472 75894197	KIT, BOTTOM MTG	HPC

ITEM IDENT NO	DESCRIPTION	WHERE USED
302 75886102	TOP MECHANICAL ASM	HPC
303 75886103	TOP MECHANICAL ASM	HPC
309 75883185	LATCH ASM	HPC
310 77650889	LATCH ASM	HPC
350 75882589	DRIVE MOTOR ASM 60-120	HPC
351 75882592	DRIVE MOTOR ASM 50-220	HPC
352 75882591	DRIVE MOTOR ASM 60-220	HPC
353 75882855	DRIVE MOTOR ASM 60-120	HPC
354 75882858	DRIVE MOTOR ASM 50-220	HPC
355 75882856	DRIVE MOTOR ASM 50-120	HPC
356 75882857	DRIVE MOTOR ASM 60-220	HPC
399 77631702	CLAMSHELL	HPC
400 77618401	CLAMSHELL (BLACK)	HPC
401 75889426	CLAMSHELL ASM	HPC
402 75897400	CLAMSHELL ASM	HPC
403 77631706	CLAMSHELL	HPC
404 77618428	CLAMSHELL	HPC
410 75889601	FRONT PANEL (BLACK)	HPC
411 77631302	FRONT PANEL	HPC
412 77631402	FRONT PANEL	HPC
413 77631406	FRONT PANEL	HPC
414 75889628	FRONT PANEL	HPC
415 75881578	SPRING	HPC
420 75889701	BUTTON (BLACK)	HPC
421 75897201	BUTTON	HPC
422 75897205	BUTTON	HPC
423 75889728	BUTTON	HPC
430 75882401	FRONT PANEL ASM	HPC
431 75882406	FRONT PANEL ASM	HPC
432 75882405	FRONT PANEL ASM	HPC
433 75882404	FRONT PANEL ASM	HPC
434 75897950	FRONT PANEL ASM	HPC
435 75897951	FRONT PANEL ASM	HPC
436 75897952	FRONT PANEL ASM	HPC
437 75897953	FRONT PANEL ASM	HPC
440 75882037	WRITE PROTECT	HPC
441 75882036	DISK IN PLACE DET	HPC
450 75882185	INDEX DETECTOR KIT	HPC

FIGURE 8-1. PRODUCT CONFIGURATION

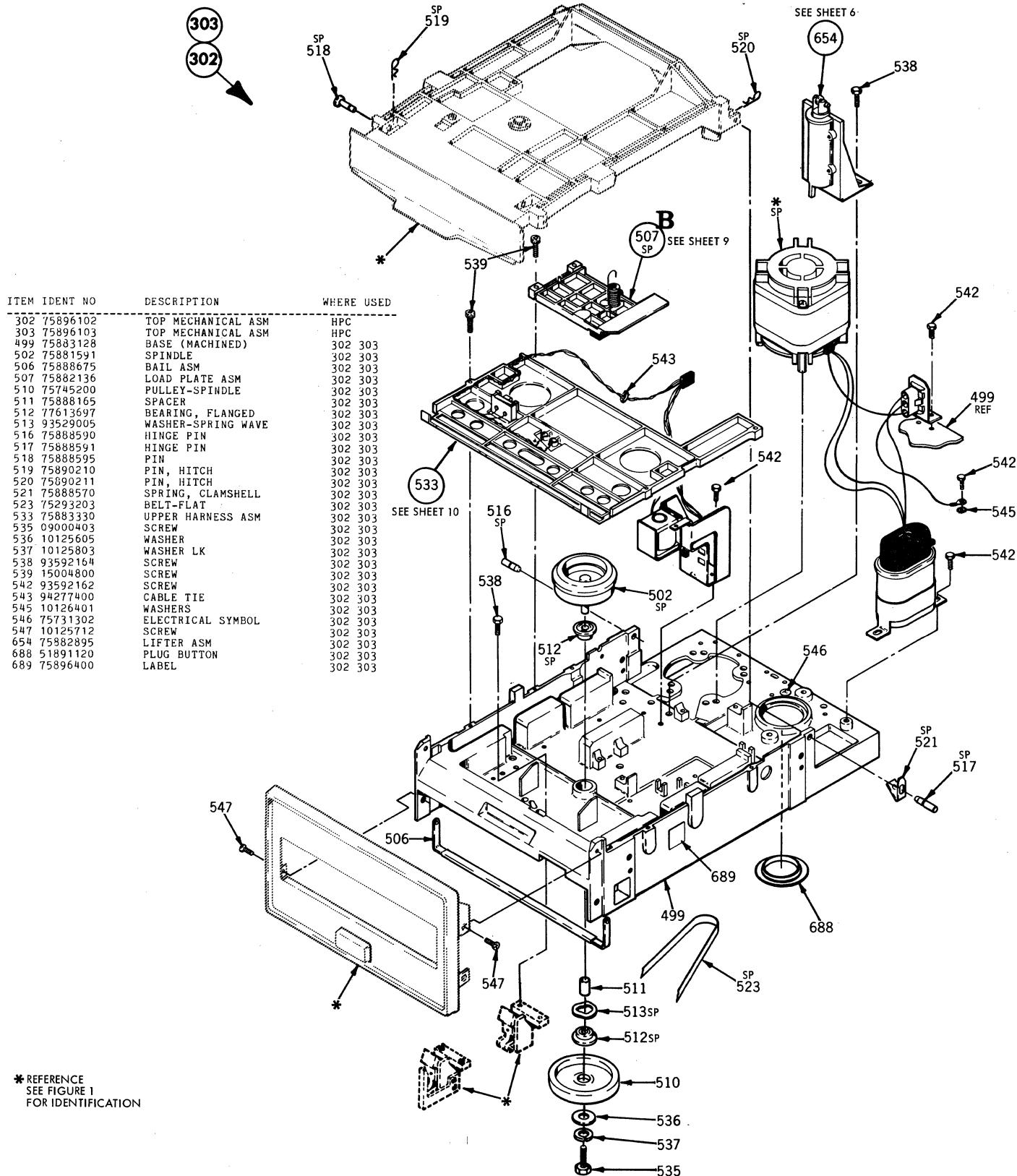
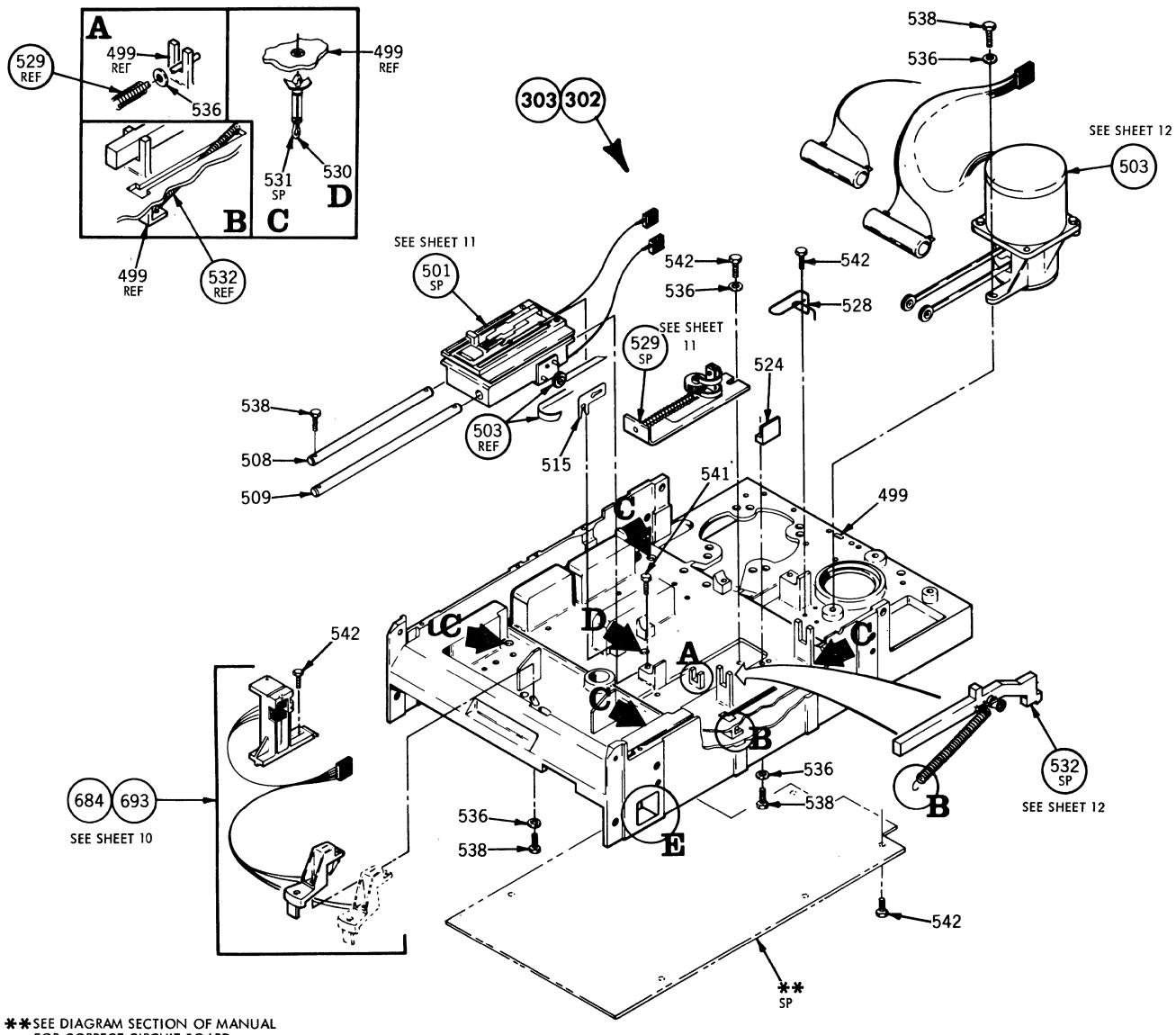
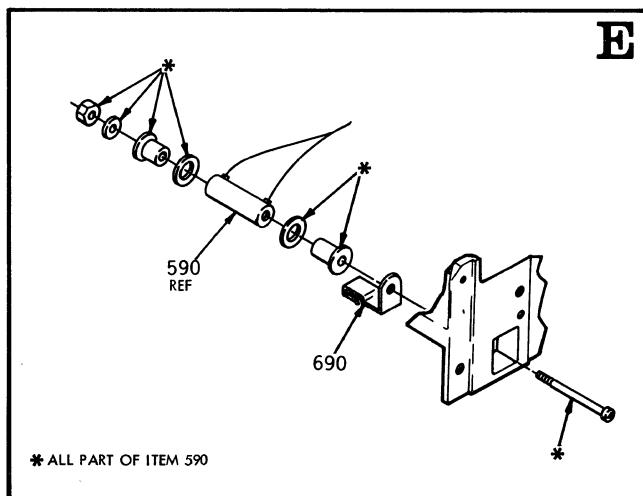


FIGURE 8-2. TOP MECHANICAL ASSEMBLY (SHEET 1 OF 2)

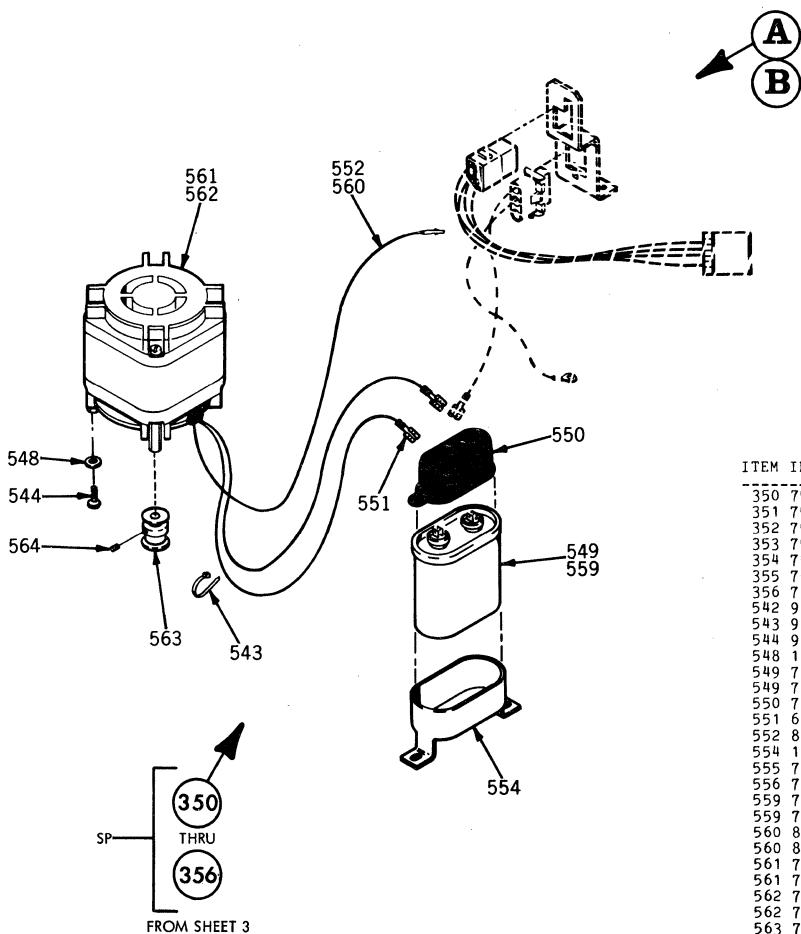
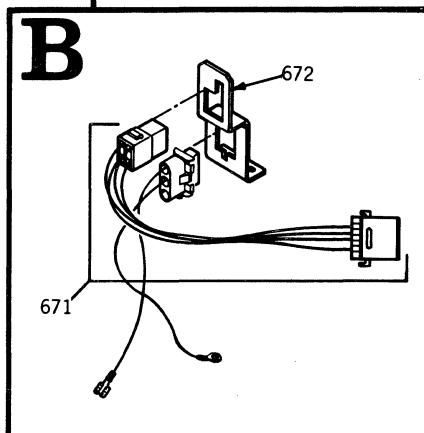
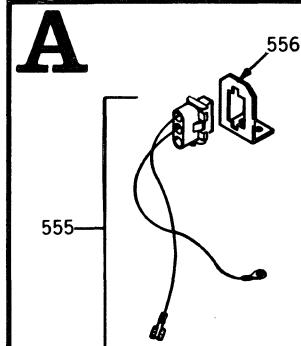
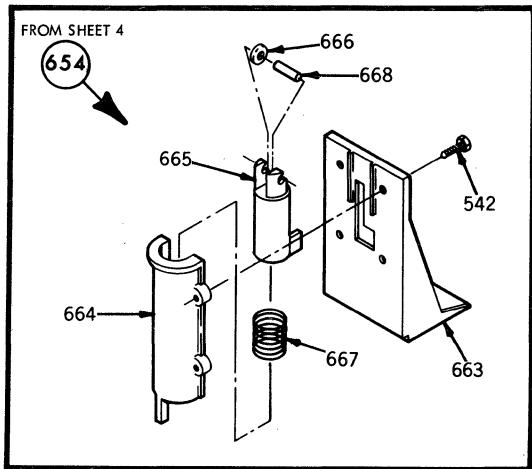


**SEE DIAGRAM SECTION OF MANUAL
FOR CORRECT CIRCUIT BOARD
IDENTIFICATION AND BREAKDOWN



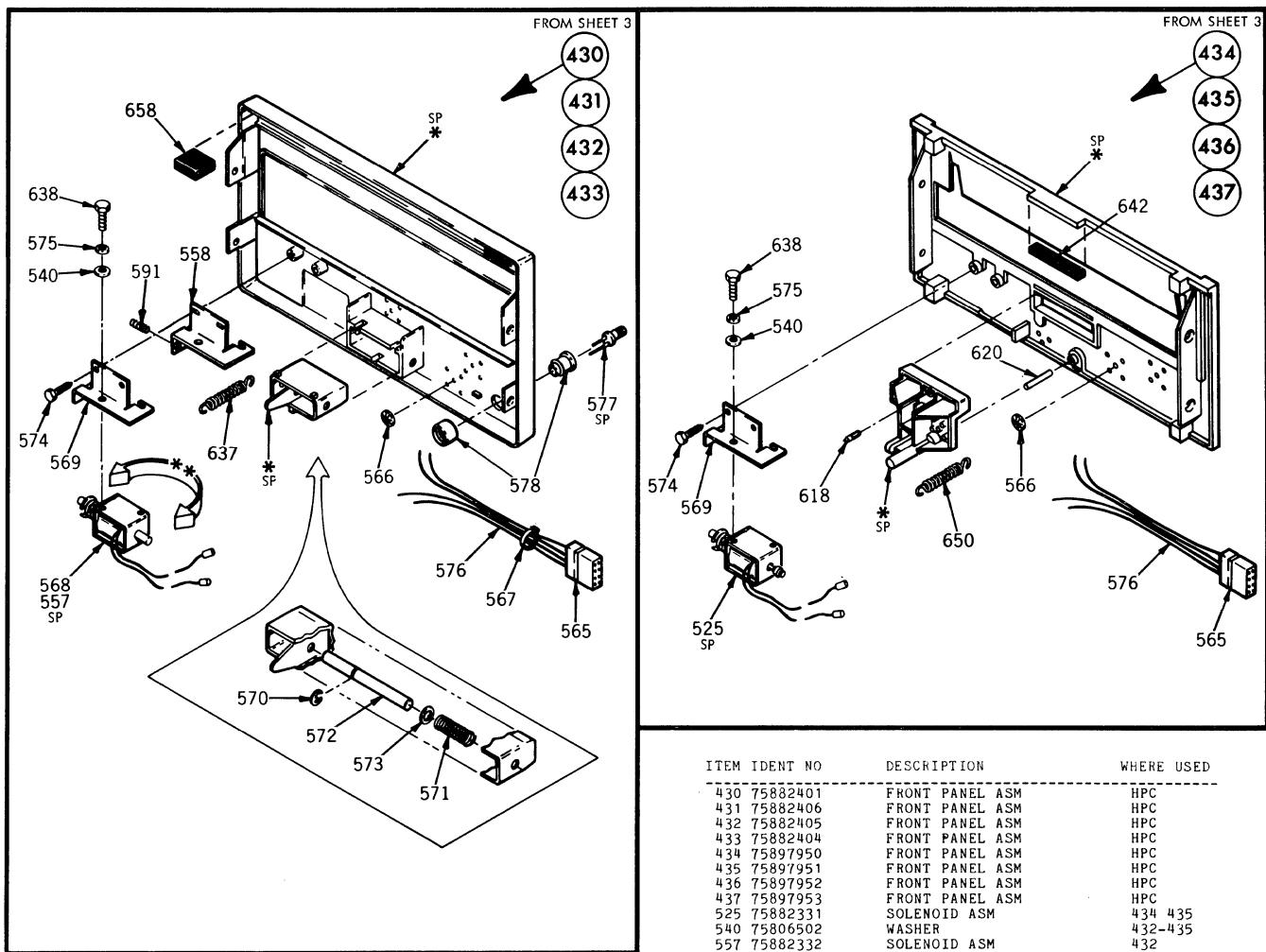
ITEM IDENT NO	DESCRIPTION	WHERE USED
302 75896102	TOP MECHANICAL ASM	HPC
303 75896103	TOP MECHANICAL ASM	HPC
499 75883128	BASE (MACHINED)	302 303
501 75896122	CARRIAGE ASSEMBLY	302 303
503 75892007	ACTUATOR ASSEMBLY	302 303
508 75881326	GUIDE CARRIAGE	302 303
509 75881275	GUIDE ROD	302 303
515 75883017	RETAINER	302 303
524 75883240	LATCH BLOCK	302 303
528 75883095	GUARD, HEAD CABLE	302 303
529 75883215	TENSION ASSEMBLY	302 303
530 75774732	CLIP-PUSH IN	302 303
531 75774736	CLIP-PUSH IN	302 303
532 75889396	EJECTOR ASM	302 303
534 09023703	SCREW	302 303
536 10125605	WASHER	302 303
538 93592164	SCREW	302 303
541 18862916	SCREW	302 303
542 93592162	SCREW	302 303
624 10126101	LOCK WASHER	302 303
684 75882177	LOWER HARNESS ASM	302
690 75897601	CABLE GUARD	302 303
693 77641815	LOWER HARNESS ASM	303

FIGURE 8-2. TOP MECHANICAL ASSEMBLY (SHEET 2 OF 2)



ITEM IDENT NO	DESCRIPTION	WHERE USED
350 75882589	DRIVE MOTOR ASM 60-120	HPC
351 75882592	DRIVE MOTOR ASM 50-220	HPC
352 75882591	DRIVE MOTOR ASM 60-220	HPC
353 75882855	DRIVE MOTOR ASM 60-120	HPC
354 75882858	DRIVE MOTOR ASM 50-220	HPC
355 75882856	DRIVE MOTOR ASM 50-120	HPC
356 75882857	DRIVE MOTOR ASM 60-220	HPC
542 93592162	SCREW	654
543 94277400	CABLE TIE	340-355
544 93592202	SCREW	350-355
548 10126104	WASHER	350-355
549 75738402	CAPACITOR	350 353
549 75738402	CAPACITOR	355
550 75772500	BOOT	350-355
551 62121108	TERMINAL	350-355
552 83435504	CONTACT	353
554 16439600	MOUNTING BRKT	350-355
555 75882341	CABLE	350-352
556 75882490	BRACKET	350-352
559 75738480	CAPACITOR	351 352
559 75738480	CAPACITOR	354
560 83435501	CONTACT	350-352
560 83435501	CONTACT	354 355
561 75726925	MOTOR	350 353
561 75726925	MOTOR	355
562 75726924	MOTOR	351 352
562 75726924	MOTOR	354
563 75896006	PULLEY-DUAL DR	350-355
564 83413405	SCREW	350-355
654 75882895	LIFTER ASM	302 303
663 75882740	COVER	654
664 75882735	CYLINDER	654
665 77658915	PISTON	654
666 75882725	ROLLER	654
667 77658910	SPRING	654
668 92021009	PIN	654
671 75883023	CABLE	353 354
671 75883023	CABLE	355
672 75882890	BRACKET	353 354
672 75882890	BRACKET	355

FIGURE 8-3. DRIVE MOTOR AND LIFTER ASSEMBLIES

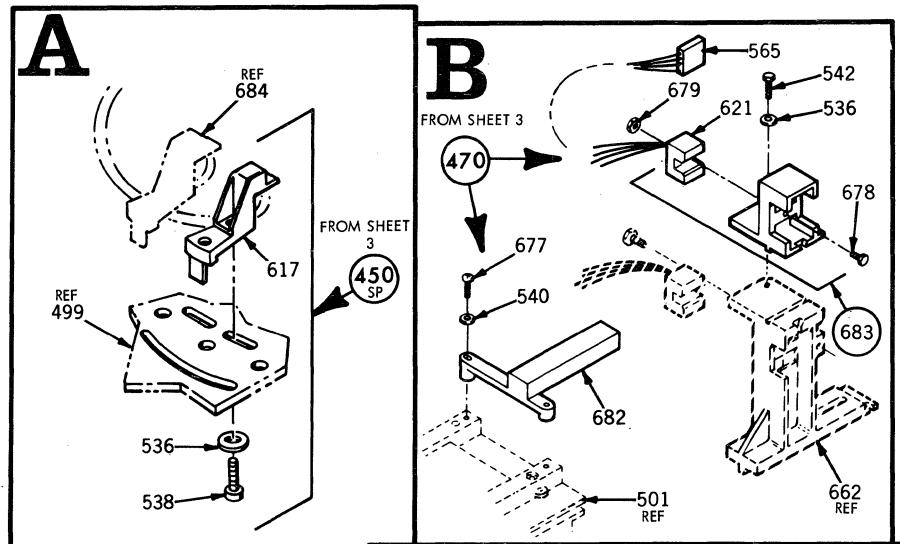


* REFERENCE
SEE FIGURE 1
FOR INFORMATION.

** SHOWN IN LOCK WITH POWER ON
POSITION. ROTATE 180° FOR LOCK
WITH POWER OFF POSITION.

ITEM IDENT NO	DESCRIPTION	WHERE USED
430 75882401	FRONT PANEL ASM	HPC
431 75882406	FRONT PANEL ASM	HPC
432 75882405	FRONT PANEL ASM	HPC
433 75882404	FRONT PANEL ASM	HPC
434 75897950	FRONT PANEL ASM	HPC
435 75897951	FRONT PANEL ASM	HPC
436 75897952	FRONT PANEL ASM	HPC
437 75897953	FRONT PANEL ASM	HPC
525 75882331	SOLENOID ASM	434 435
540 75806502	WASHER	432-435
557 75882332	SOLENOID ASM	432
558 77636695	SOLENOID MOUNT	432
565 75293954	HOUSING	431-437
566 00848201	RET RING	431-437
567 94277400	CABLE TIE	431-433
568 75882330	SOLENOID ASM	433
569 77632960	SOLENOID MOUNT	433-435
570 75888600	SHAFT LOCK	432 433
571 75882035	SPRING	432 433
572 92033147	RET RING	432 433
573 75882107	WASHER	432 433
574 94376917	SCREW	432-435
575 10125801	WASHER	432-435
576 75882335	CABLE	431-437
577 75810701	LED	431-433
578 75810703	RET RING	431-433
591 93820166	SET SCREW	432
618 77612981	LIGHT EMITTING DIODE	434-437
620 77610030	DOWEL PIN	434-437
637 75899167	SPRING	430-433
638 10127102	SCREW	432-435
642 77646804	BUMPER	434-437
650 75899166	SPRING	434-437
658 75883338	BUMPER	431-433

FIGURE 8-4. FRONT PANEL ASSEMBLY



ITEM IDENT NO	DESCRIPTION	WHERE USED
440 75882037	WRITE PROTECT	HPC
441 75882036	DISK IN PLACE DET	HPC
450 75882185	INDEX DETECTOR KIT	HPC
460 75889979	DOOR INTERLOCK KIT	HPC
470 75883335	KIT, TK "43"	HPC
490 REFERENCE	SEE FIGURE 2	REF
501 REFERENCE	SEE FIGURE 2 & 8	REF
533 REFERENCE	SEE FIGURES 2 & 7	REF
536 10125605	WASHER	450
538 93592164	SCREW	450
540 75806502	WASHER	470
542 93592162	SCREW	470
565 75293954	HOUSING	441
617 75889295	INDEX DETECTOR ASM	450
621 75881365	OPTICAL SWITCH	470
622 10127311	SCREW	441
625 REFERENCE	SEE FIGURE 5	REF
647 75880751	SWITCH	460
648 75889215	NUT PLATE	460
649 10127169	SCREW	460
651 75881363	OPTICAL SWITCH ASM	440
652 75881364	OPTICAL SWITCH	441
660 REFERENCE	SEE FIGURE 7	REF
662 REFERENCE	SEE FIGURE 5	REF
677 10127105	SCREW	470
678 10127167	SCREW	470
679 10125102	NUT	470
681 75882880	HOUSING	470
682 75882513	FLAG	470
683 75883196	SENSOR ASM, TK "43"	470
684 REFERENCE	SEE FIGURES 2 & 7	REF

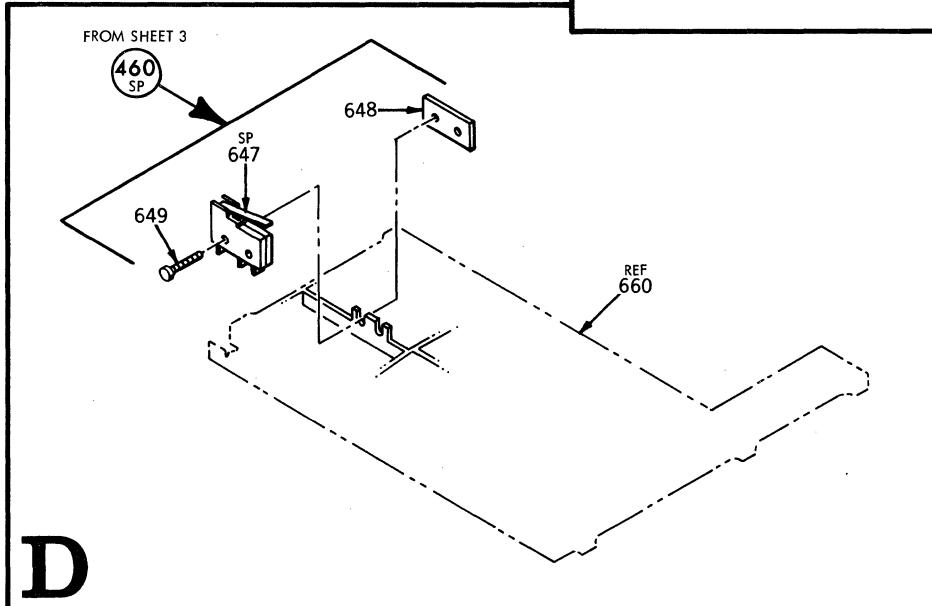
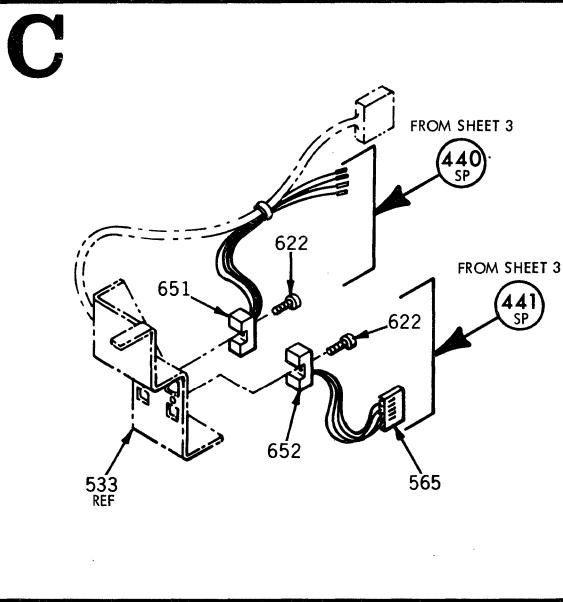
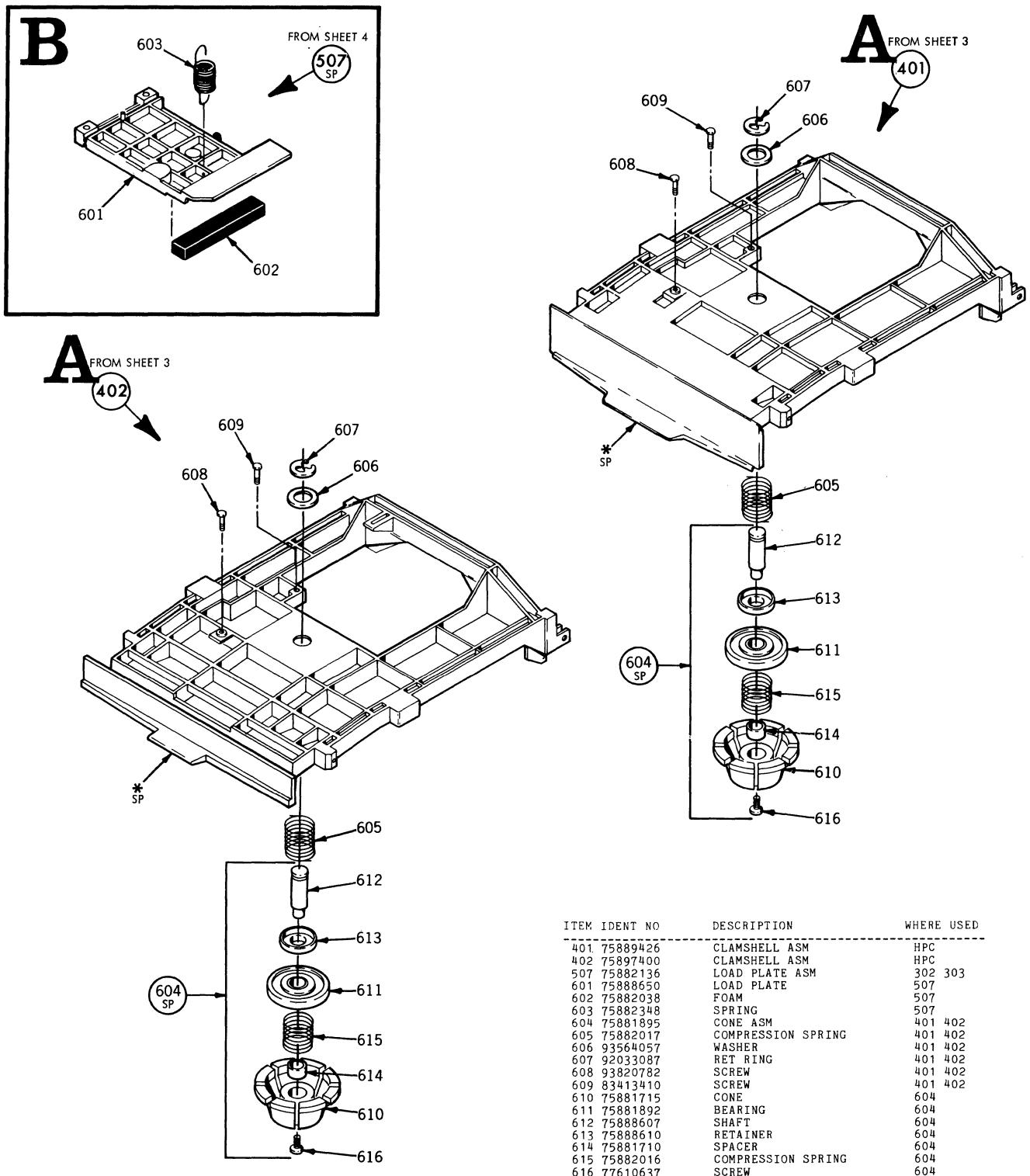


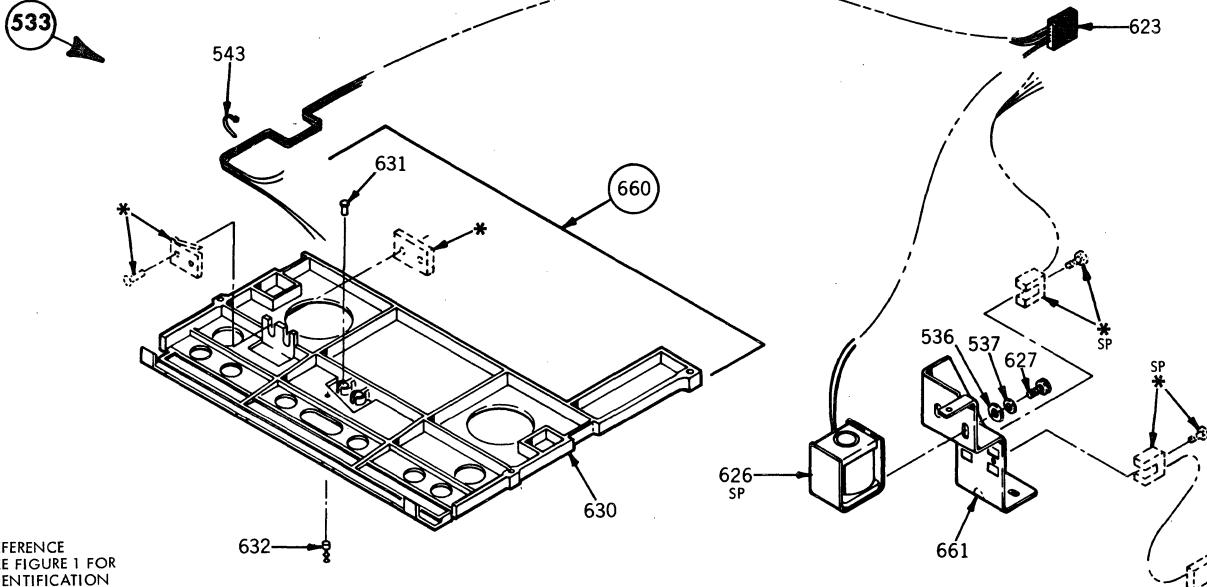
FIGURE 8-5. FEATURE KITS



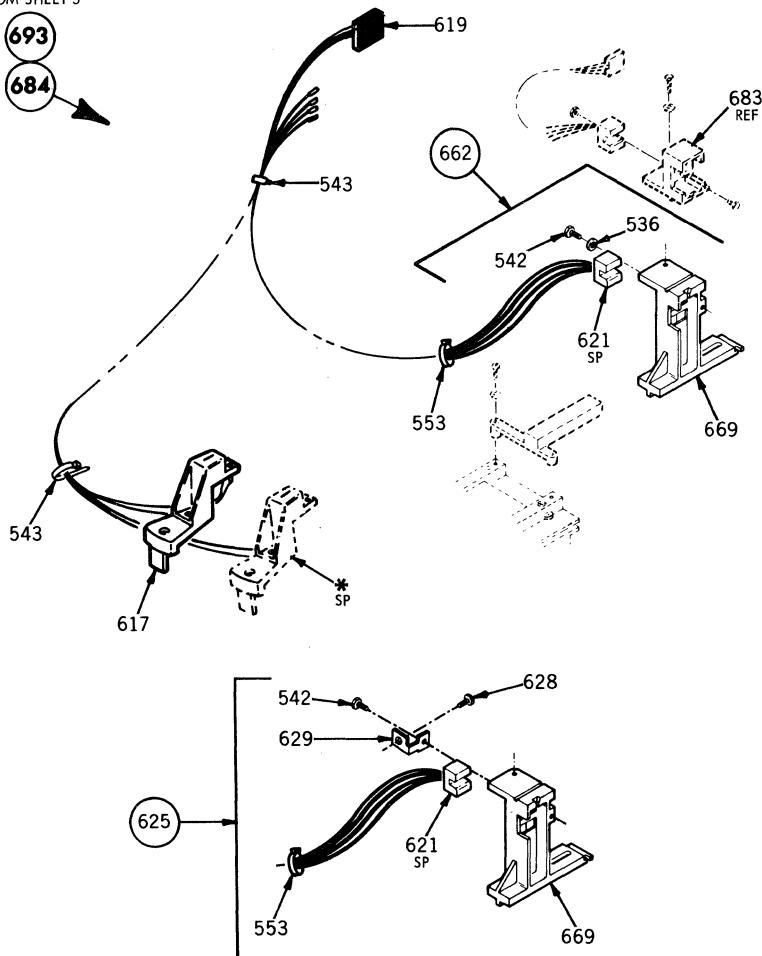
*REFERENCE
SEE FIGURE 1 FOR
IDENTIFICATION

FIGURE 8-6. CLAMSHELL AND LOAD PLATE ASSEMBLIES

FROM SHEET 4



FROM SHEET 5



ITEM IDENT NO	DESCRIPTION	WHERE USED
533 75883330	UPPER HARNESS ASM	302 303
537 10125605	WASHER	533
537 10125603	WASHER LK	533
542 93592162	SCREW	662 625
543 94277400	CABLE TIE	684 693
543 94277400	CABLE TIE	533
553 77612011	CABLE TIE	684 693
617 75889295	INDEX DETECTOR ASM	684 693
619 75882145	LOWER CABLE	684 693
621 75881365	OPTICAL SWITCH	662 625
623 75882170	UPPER CABLE	660
625 77622495	"O" TRACK ASM	693
626 75882327	SOLENOID	533
627 10126217	SCREW	533
628 93820248	SCREW	625
629 77646309	"O" TRACK STOP	625
630 75883180	UPPER GUIDE	660
631 75720001	PHOTO SENSE	660
632 92498024	TERMINAL	660
660 75883075	UPPER GUIDE ASM	533
661 75888696	BRACKET	533
662 75882885	"O" TRACK ASM	684
669 75883165	MOUNT	662 625
683 REFERENCE	SEE FIGURE 5	REF
684 75882177	LOWER HARNESS ASM	302
693 77641815	LOWER HARNESS ASM	303

FIGURE 8-7. HARNESS ASSEMBLIES

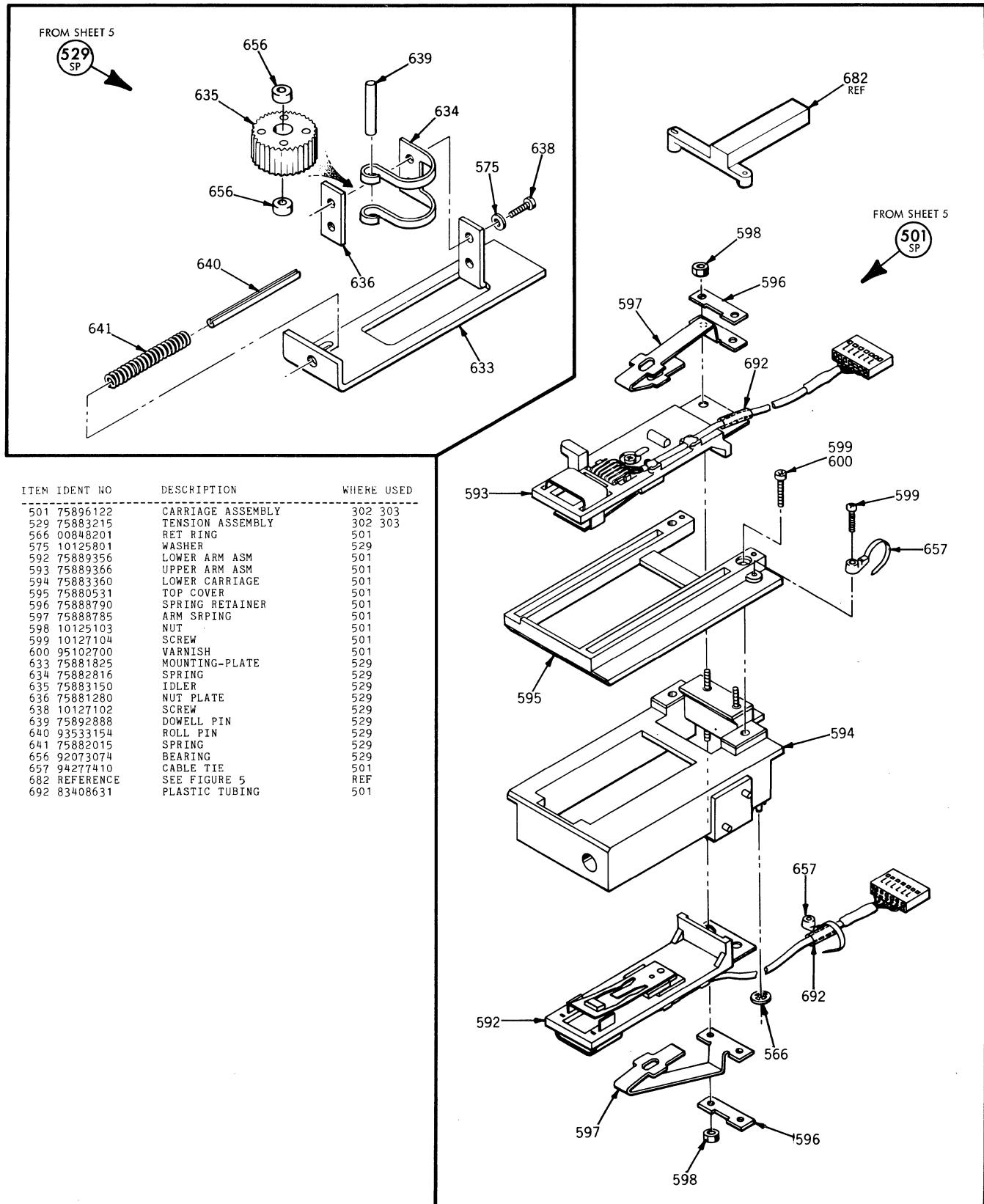
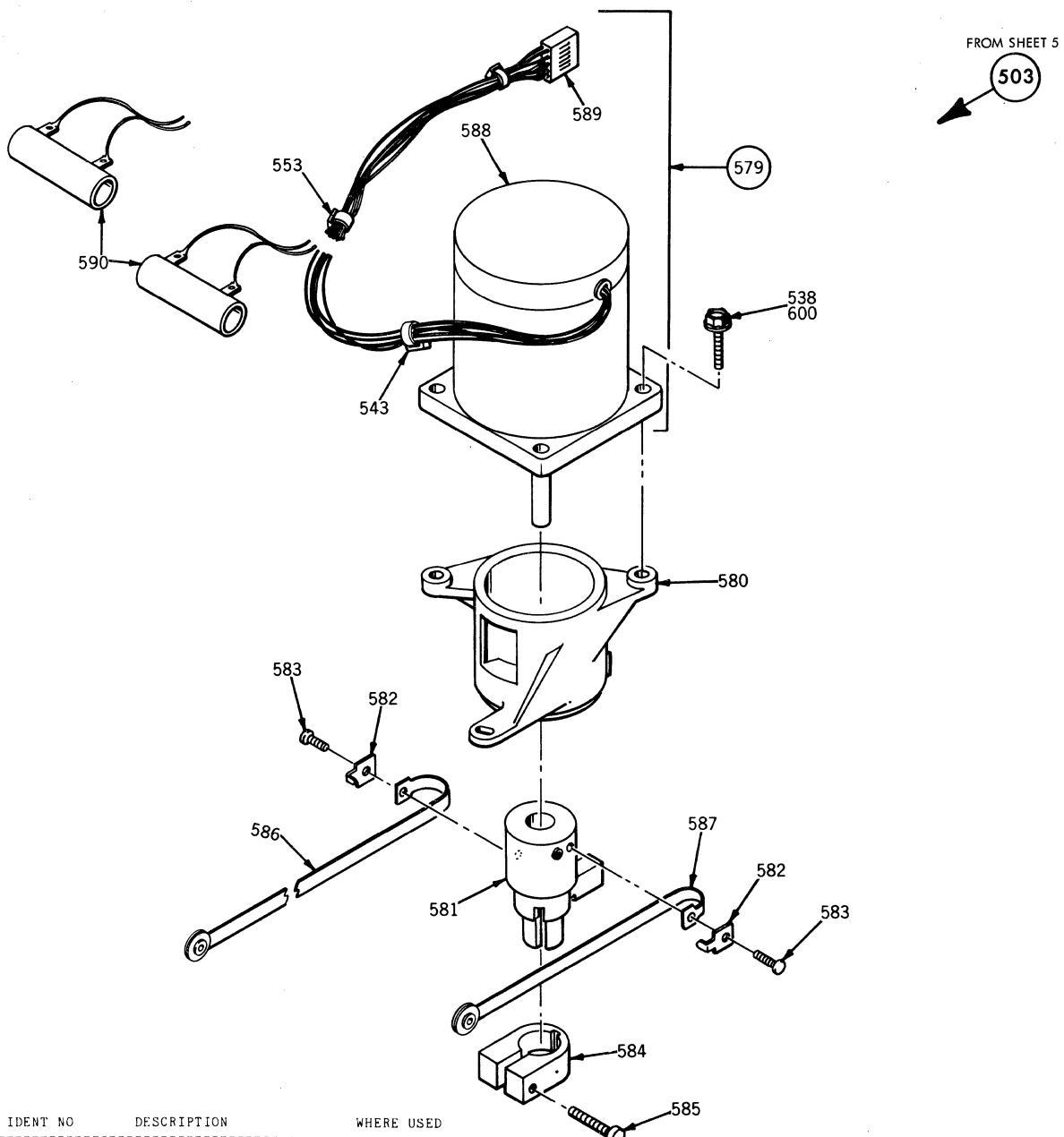


FIGURE 8-8. CARRIAGE AND TENSION ASSEMBLIES



ITEM IDENT NO	DESCRIPTION	WHERE USED
503 75892007	ACTUATOR ASSEMBLY	302 303
532 75889396	EJECTOR ASM	302 303
538 93592164	SCREW	503
543 94277400	CABLE TIE	579
553 77612011	CABLE TIE	579
566 00848201	RET RING	532
579 75881932	STEPPER MOTOR ASM	503
580 75881563	MOTOR ADAPTER	503
581 75881441	PULLEY	503
582 75881785	BAND RETAINER	503
583 75882026	SCREW	503
584 75881287	CLAMP	503
585 18862716	SCREW	503
586 75883120	BAND	503
587 75883121	BAND	503
588 75882150	STEPPER MOTOR	579
589 75883312	RESISTOR CABLE	579
590 77612491	RESISTOR	579
600 95102700	VARNISH	503
643 75890856	LATCH	532
644 75893550	SPRING	532
646 75881575	SPRING	532
659 75893269	EJECTOR	532

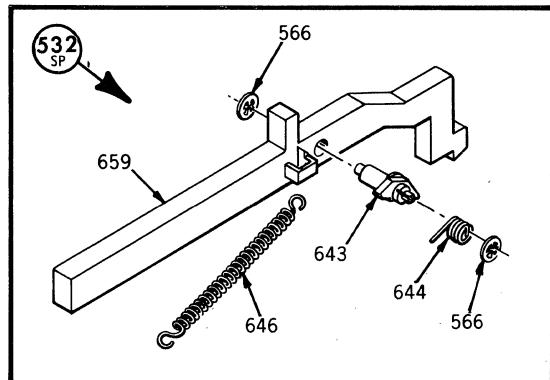
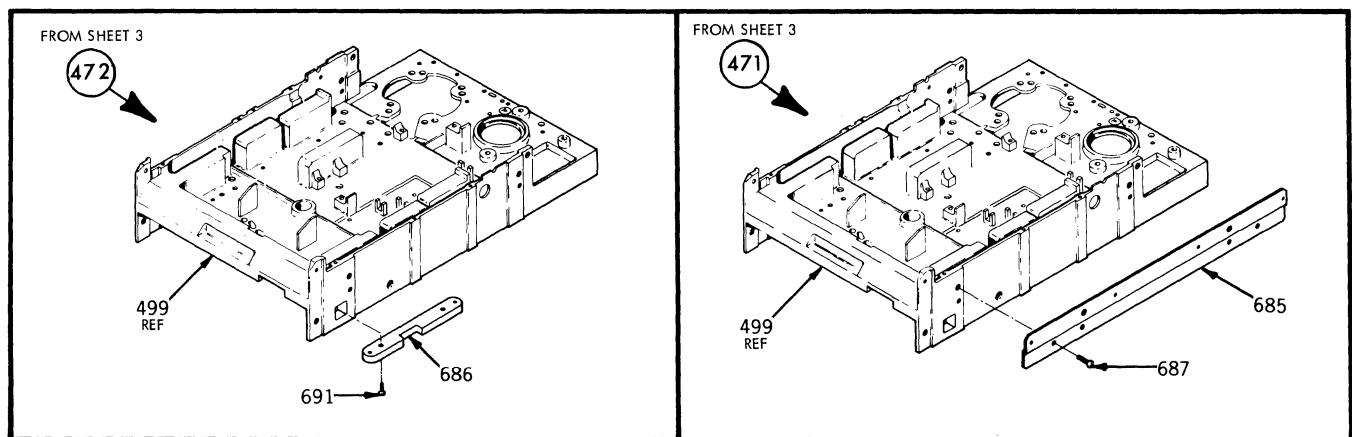


FIGURE 8-9. ACTUATOR AND EJECTOR ASSEMBLIES



ITEM IDENT NO	DESCRIPTION	WHERE USED
471 75883336	KIT, SIDE MTG	HPC
472 75894197	KIT, BOTTOM MTG	HPC
499 REFERENCE	SEE FIGURE 2	REF
685 10127122	SCREW	471
686 75881607	ADAPTER	472
687 75883001	ADAPTER	471
691 10127121	SCREW	472

FIGURE 8-10. FEATURE KITS

8.6 PARTS LIST INSTRUCTIONS

8.6.1 ILLUSTRATION PARTS LISTS

The parts list for each illustration is an extract from the Top-Down Assembly/Component Parts list and contains only those parts depicted. Refer to paragraph 8.6.2 for explanation of parts list.

8.6.2 TOP-DOWN ASSEMBLY/COMPONENT PARTS LIST

- a. Starts at HPC level and lists all parts in Item Number sequence.
- b. Correlates Item numbers with part Identification numbers and the Description of each.
- c. Identifies where each part is used (where used column) within the device by listing the item number(s) of the next higher assembly.

NOTE

Items 300 through 499 will carry "HPC" in the "Where Used" column. Items shown for reference only will carry "REF."

- d. Defines the location of each part by listing the sheet number(s) where depicted.

NOTE

The same part may be used in any number of assemblies or sheet locations.

8.6.3 CROSS REFERENCE INDEX

- a. Lists all parts in numeric sequence (by Identification Number).
- b. In conjunction with the referenced sheet number (third column) and illustrations, defines the physical location of each item identified.

8.6.4 SHEET NUMBER REFERENCING

Sheet numbers referenced on Parts Lists and Illustrations refers to sheet locations in this section. Example: Sheet reference 3 represents sheet 8-3, sheet 4 represents sheet 8-4, etc.

TOP-DOWN ASSEMBLY/COMPONENT PART LIST

ITEM IDENT NO	DESCRIPTION	WHERE USED	HEET	ITEM IDENT NO	DESCRIPTION	WHERE USED	HEET
302 75896102	TOP MECHANICAL ASM	HPC	S03	533 REFERENCE	SEE FIGURES 2 & 7	REF	S08
302 75896102	TOP MECHANICAL ASM	HPC	S04	534 09023703	SCREW	302 303	S04
302 75896102	TOP MECHANICAL ASM	HPC	S05	535 09000403	SCREW	302 303	S04
303 75896103	TOP MECHANICAL ASM	HPC	S03	536 10125605	WASHER	302 303	S05
303 75896103	TOP MECHANICAL ASM	HPC	S04	536 10125605	WASHER	302 303	S05
303 75896103	TOP MECHANICAL ASM	HPC	S05	536 10125605	WASHER	533	S10
309 75883185	LATCH ASM	HPC	S03	536 10125605	WASHER	450	S08
310 77650889	LATCH ASM	HPC	S03	537 10125803	WASHER LK	302 303	S04
350 75882589	DRIVE MOTOR ASM 60-120	HPC	S03	537 10125803	WASHER LK	533	S10
350 75882589	DRIVE MOTOR ASM 60-120	HPC	S06	538 93592164	SCREW	302 303	S04
351 75882592	DRIVE MOTOR ASM 50-220	HPC	S03	538 93592164	SCREW	302 303	S05
351 75882592	DRIVE MOTOR ASM 50-220	HPC	S06	538 93592164	SCREW	503	S12
352 75882591	DRIVE MOTOR ASM 60-220	HPC	S03	538 93592164	SCREW	450	S08
352 75882591	DRIVE MOTOR ASM 60-220	HPC	S06	539 15004800	SCREW	302 303	S04
353 75882855	DRIVE MOTOR ASM 60-120	HPC	S03	540 75806502	WASHER	432-435	S07
353 75882855	DRIVE MOTOR ASM 60-120	HPC	S06	540 75806502	WASHER	470	S08
354 75882858	DRIVE MOTOR ASM 50-220	HPC	S03	541 18862916	SCREW	302 303	S05
354 75882858	DRIVE MOTOR ASM 50-220	HPC	S06	542 93592162	SCREW	302 303	S04
355 75882856	DRIVE MOTOR ASM 50-120	HPC	S03	542 93592162	SCREW	302 303	S05
355 75882856	DRIVE MOTOR ASM 50-120	HPC	S06	542 93592162	SCREW	654	S06
399 77631702	CLAMSHELL	HPC	S03	542 93592162	SCREW	662 625	S10
400 77618401	CLAMSHELL (BLACK)	HPC	S03	542 93592162	SCREW	470	S08
401 75889426	CLAMSHELL ASM	HPC	S03	543 94277400	CABLE TIE	302 303	S04
401 75889426	CLAMSHELL ASM	HPC	S09	543 94277400	CABLE TIE	579	S12
402 75897400	CLAMSHELL ASM	HPC	S03	543 94277400	CABLE TIE	684 693	S10
402 75897400	CLAMSHELL ASM	HPC	S09	543 94277400	CABLE TIE	533	S10
403 77631706	CLAMSHELL	HPC	S03	543 94277400	CABLE TIE	340-355	S06
404 77618428	CLAMSHELL	HPC	S03	544 93592202	SCREW	350-355	S06
410 75889601	FRONT PANEL (BLACK)	HPC	S03	545 10126401	WASHERS	302 303	S04
411 77631302	FRONT PANEL	HPC	S03	546 75731302	ELECTRICAL SYMBOL	302 303	S04
412 77631402	FRONT PANEL	HPC	S03	547 10125712	SCREW	302 303	S04
413 77631406	FRONT PANEL	HPC	S03	548 10126104	WASHER	350-355	S06
414 75889628	FRONT PANEL	HPC	S03	549 75738402	CAPACITOR	350 353	S06
415 75881578	SPRING	HPC	S03	549 75738402	CAPACITOR	355	S06
420 75889701	BUTTON (BLACK)	HPC	S03	550 75772500	BOOT	350-355	S06
421 75897201	BUTTON	HPC	S03	551 62121108	TERMINAL	350-355	S06
422 75897205	BUTTON	HPC	S03	552 83435504	CONTACT	353	S06
423 75889728	BUTTON	HPC	S03	553 77612011	CABLE TIE	579	S12
430 75882401	FRONT PANEL ASM	HPC	S03	553 77612011	CABLE TIE	684 693	S10
430 75882401	FRONT PANEL ASM	HPC	S07	554 16439600	MOUNTING BRKT	350-355	S06
431 75882406	FRONT PANEL ASM	HPC	S03	555 75882341	CABLE	350-352	S06
431 75882406	FRONT PANEL ASM	HPC	S07	556 75882490	BRACKET	350-352	S06
432 75882405	FRONT PANEL ASM	HPC	S03	557 75882332	SOLENOID ASM	432	S07
432 75882405	FRONT PANEL ASM	HPC	S07	558 77636695	SOLENOID MOUNT	432	S07
433 75882404	FRONT PANEL ASM	HPC	S03	559 75738480	CAPACITOR	351 352	S06
433 75882404	FRONT PANEL ASM	HPC	S07	559 75738480	CAPACITOR	354	S06
434 75897950	FRONT PANEL ASM	HPC	S03	560 83435501	CONTACT	350-352	S06
434 75897950	FRONT PANEL ASM	HPC	S07	560 83435501	CONTACT	354 355	S06
435 75897951	FRONT PANEL ASM	HPC	S03	561 75726925	MOTOR	350 353	S06
435 75897951	FRONT PANEL ASM	HPC	S07	561 75726925	MOTOR	355	S06
436 75897952	FRONT PANEL ASM	HPC	S03	562 75726924	MOTOR	351 352	S06
436 75897952	FRONT PANEL ASM	HPC	S07	562 75726924	MOTOR	354	S06
437 75897952	FRONT PANEL ASM	HPC	S03	563 75896006	PULLEY-DUAL DR	350-355	S06
437 75897953	FRONT PANEL ASM	HPC	S03	564 83413405	SCREW	350-355	S06
440 75882037	WRITE PROTECT	HPC	S03	565 75293954	HOUSING	431-437	S07
440 75882037	WRITE PROTECT	HPC	S08	565 75293954	HOUSING	441	S08
441 75882036	DISK IN PLACE DET	HPC	S03	566 00848201	RET RING	501	S11
441 75882036	DISK IN PLACE DET	HPC	S08	566 00848201	RET RING	431-437	S07
450 75882185	INDEX DETECTOR KIT	HPC	S03	566 00848201	RET RING	532	S12
450 75882185	INDEX DETECTOR KIT	HPC	S08	567 94277400	CABLE TIE	431-433	S07
460 75889979	DOOR INTERLOCK KIT	HPC	S03	568 75882330	SOLENOID ASM	433	S07
460 75889979	DOOR INTERLOCK KIT	HPC	S08	569 77632960	SOLENOID MOUNT	433-435	S07
470 75883335	KIT, TK "43"	HPC	S03	570 75888600	SHAFT LOCK	432 433	S07
470 75883335	KIT, TK "43"	HPC	S08	571 75882035	SPRING	432 433	S07
471 75883336	KIT, SIDE MTG	HPC	S03	572 92033147	RET RING	432 433	S07
471 75883336	KIT, SIDE MTG	HPC	S13	573 75882107	WASHER	432 433	S07
472 75894197	KIT, BOTTOM MTG	HPC	S03	574 94376917	SCREW	432-435	S07
472 75894197	KIT, BOTTOM MTG	HPC	S13	575 10125801	WASHER	432-435	S07
499 75883128	BASE (MACHINED)	302 303	S04	575 10125801	WASHER	529	S11
499 75883128	BASE (MACHINED)	302 303	S05	576 75882335	CABLE	431-437	S07
499 REFERENCE	SEE FIGURE 2	REF	S08	577 75810701	LED	431-433	S07
499 REFERENCE	SEE FIGURE 2	REF	S13	578 75810703	RET RING	431-433	S07
501 75896122	CARRIAGE ASSEMBLY	302 303	S11	579 75881932	STEPPER MOTOR ASM	503	S12
501 75896122	CARRIAGE ASSEMBLY	302 303	S05	580 75881563	MOTOR ADAPTER	503	S12
501 REFERENCE	SEE FIGURE 2 & 8	REF	S08	581 75881441	PULLEY	503	S12
502 75881591	SPINDLE	302 303	S04	582 75881785	BAND RETAINER	503	S12
503 75892007	ACTUATOR ASSEMBLY	302 303	S05	583 75882026	SCREW	503	S12
503 75892007	ACTUATOR ASSEMBLY	302 303	S12	584 75881287	CLAMP	503	S12
506 75888675	BAIL ASM	302 303	S04	585 18862716	SCREW	503	S12
507 75882136	LOAD PLATE ASM	302 303	S04	586 75883120	BAND	503	S12
507 75882136	LOAD PLATE ASM	302 303	S09	587 75883121	BAND	503	S12
508 75881326	GUIDE CARRIAGE	302 303	S05	588 75882150	STEPPER MOTOR	579	S12
509 75881275	GUIDE ROD	302 303	S05	589 75883312	RESISTOR CABLE	579	S12
510 75745200	PULLEY-SPINDLE	302 303	S04	590 77612491	RESISTOR	579	S12
511 75888165	SPACER	302 303	S04	591 93820166	SET SCREW	432	S07
512 77613697	BEARING, FLANGED	302 303	S04	592 75889356	LOWER ARM ASM	501	S11
513 93529005	WASHER-SPRING WAVE	302 303	S04	593 75889366	UPPER ARM ASM	501	S11
515 75883017	RETAINER	302 303	S05	594 75883360	LOWER CARRIAGE	501	S11
516 75888590	HINGE PIN	302 303	S04	595 75880531	TOP COVER	501	S11
517 75888591	HINGE PIN	302 303	S04	596 75888790	SPRING RETAINER	501	S11
518 75888595	PIN	302 303	S04	597 75888785	ARM SPRING	501	S11
519 75890210	PIN, HITCH	302 303	S04	598 10125103	NUT	501	S11
520 75890211	PIN, HITCH	302 303	S04	599 10127104	SCREW	501	S11
521 75888570	SPRING, CLAMSHELL	302 303	S04	600 95102700	VARNISH	501	S11
523 75293203	BELT-FLAT	302 303	S04	600 95102700	VARNISH	503	S12
524 75883240	LATCH BLOCK	302 303	S05	601 75888650	LOAD PLATE	507	S09
525 75882331	SOLENOID ASM	434 435	S07	602 75882038	FOAM	507	S09
528 75882095	GUARD, HEAD CABLE	302 303	S05	603 75882348	SPRING	507	S09
529 75883215	TENSION ASSEMBLY	302 303	S05	604 75881895	CONE ASM	401 402	S09
529 75883215	TENSION ASSEMBLY	302 303	S11	605 75882017	COMPRESSION SPRING	401 402	S09
530 75774732	CLIP-PUSH IN	302 303	S05	606 93564057	WASHER	401 402	S09
531 75774736	CLIP-PUSH IN	302 303	S05	607 92033087	RET RING	401 402	S09
532 75889396	EJECTOR ASM	302 303	S05	608 93820782	SCREW	401 402	S09
533 75889330	UPPER HARNESS ASM	302 303	S12	609 83413410	CONE	401 402	S09
533 75889330	UPPER HARNESS ASM	302 303	S04	610 75881715	BEARING	604	S09
				611 75881892		604	S09

TOP-DOWN ASSEMBLY/COMPONENT PART LIST

ITEM IDENT NO	DESCRIPTION	WHERE USED	HEET
612 75888607	SHAFT	604	S09
613 75888610	RETAINER	604	S09
614 75881710	SPACER	604	S09
615 75882016	COMPRESSION SPRING	604	S09
616 77610637	SCREW	604	S09
615 75882016	COMPRESSION SPRING	604	S09
616 77610637	SCREW	604	S09
617 75889295	INDEX DETECTOR ASM	684 693	S10
617 75889295	INDEX DETECTOR ASM	450	S08
618 77612981	LIGHT EMITTING DIODE	434-437	S07
619 75882145	LOWER CABLE	684 693	S10
620 77610030	DOWEL PIN	434-437	S07
621 75881365	OPTICAL SWITCH	662 625	S10
621 75881365	OPTICAL SWITCH	470	S08
622 10127311	SCREW	440 441	S08
623 75882170	UPPER CABLE	660	S10
624 10126101	LOCK WASHER	302 303	S05
625 REFERENCE	SEE FIGURE 5	REF	S08
625 77622495	"0" TRACK ASM	693	S10
626 75882327	SOLENOID	533	S10
627 10126217	SCREW	533	S10
628 93820248	SCREW	625	S10
629 77646309	"0" TRACK STOP	625	S10
630 75883180	UPPER GUIDE	660	S10
631 75720001	PHOTO SENSE	660	S10
632 92498024	TERMINAL	660	S10
633 75881825	MOUNTING-PLATE	529	S11
634 75882816	SPRING	529	S11
635 75883150	IDLER	529	S11
636 75881280	NUT PLATE	529	S11
637 75899167	SPRING	430-433	S07
638 10127102	SCREW	432-435	S07
638 10127102	SCREW	529	S11
639 75892888	DOWELL PIN	529	S11
640 93533154	ROLL PIN	529	S11
641 75882015	SPRING	529	S11
642 77646804	BUMPER	434-437	S07
643 75890856	LATCH	532	S12
644 75893550	SPRING	532	S12
646 75881575	SPRING	532	S12
647 75880751	SWITCH	460	S08
648 75889215	NUT PLATE	460	S08
649 10127169	SCREW	460	S08
650 75899166	SPRING	434-437	S07
651 75881363	OPTICAL SWITCH ASM	440	S08
652 75881364	OPTICAL SWITCH	441	S08
654 75882895	LIFTER ASM	302 303	S04
654 75882895	LIFTER ASM	302 303	S06
656 92073074	BEARING	529	S11
657 94277410	CABLE TIE	501	S11
658 75883338	BUMPER	431-433	S07
659 75893269	EJECTOR	532	S12
660 75883075	UPPER GUIDE ASM	533	S10
661 REFERENCE	SEE FIGURE 7	REF	S08
662 75888696	BRACKET	533	S10
662 75882885	"0" TRACK ASM	684	S10
662 REFERENCE	SEE FIGURE 5	REF	S08
663 75882740	COVER	654	S06
664 75882735	CYLINDER	654	S06
665 77658915	PISTON	654	S06
666 75882725	ROLLER	654	S06
667 77658910	SPRING	654	S06
668 92021009	PIN	654	S06
669 75883165	MOUNT	662 625	S10
671 75883023	CABLE	353 354	S06
671 75883023	CABLE	355	S06
672 75882890	BRACKET	353 354	S06
672 75882890	BRACKET	355	S06
677 10127105	SCREW	470	S08
678 10127167	SCREW	470	S08
679 10125102	NUT	470	S08
681 75882880	HOUSING	470	S08
682 75882513	FLAG	470	S08
682 REFERENCE	SEE FIGURE 5	REF	S11
683 75883196	SENSOR ASM, TK "43"	470	S08
683 REFERENCE	SEE FIGURE 5	REF	S10
684 75882177	LOWER HARNESS ASM	302	S05
684 75882177	LOWER HARNESS ASM	302	S10
684 REFERENCE	SEE FIGURES 2 & 7	REF	S08
685 10127122	SCREW	471	S13
686 75881607	ADAPTER	472	S13
687 75883001	ADAPTER	471	S13
688 51891120	PLUG BUTTON	302 303	S04
689 75896400	LABEL	302 303	S04
690 75897601	CABLE GUARD	302 303	S05
691 10127121	SCREW	472	S13
692 83408631	PLASTIC TUBING	501	S11
693 77641815	LOWER HARNESS ASM	303	S05
693 77641815	LOWER HARNESS ASM	303	S10

CROSS REFERENCE INDEX

ITEM IDENT NO	ITEM IDENT NO	ITEM IDENT NO	ITEM IDENT NO
566 00848201	S12	603 75882348	S09
566 00848201	S07	430 75882401	S07
566 00848201	S11	430 75882401	S03
535 09000403	S04	433 75882404	S07
534 09023703	S05	433 75882404	S03
679 10125102	S08	432 75882405	S07
598 10125103	S11	432 75882405	S03
536 10125605	S04	431 75882406	S07
536 10125605	S08	431 75882406	S03
536 10125605	S10	556 75882490	S06
536 10125605	S05	682 75882513	S08
547 10125712	S04	350 75882589	S06
575 10125801	S11	350 75882589	S03
575 10125801	S07	352 75882591	S06
537 10125803	S10	352 75882591	S03
537 10125803	S04	351 75882592	S06
624 10126101	S05	351 75882592	S03
548 10126104	S06	666 75882725	S06
627 10126217	S10	664 75882735	S06
545 10126401	S04	663 75882740	S06
638 10127102	S07	634 75882816	S11
638 10127102	S11	353 75882855	S06
599 10127104	S11	353 75882855	S03
677 10127105	S08	355 75882856	S06
691 10127121	S13	355 75882856	S03
685 10127122	S13	356 75882857	S06
678 10127167	S08	356 75882857	S03
649 10127169	S08	354 75882858	S06
622 10127311	S08	354 75882858	S03
539 15004800	S04	681 75882880	S08
554 16439600	S06	662 75882885	S10
585 18862716	S12	672 75882890	S06
541 18862916	S05	672 75882890	S06
688 51891120	S04	654 75882895	S04
551 62121108	S06	654 75882895	S06
523 75293203	S04	687 75883001	S13
565 75293394	S08	515 75883017	S05
565 75293394	S07	671 75883023	S06
531 75720001	S10	671 75883023	S06
562 75726924	S06	660 75883075	S10
562 75726924	S06	528 75883095	S05
561 75726925	S06	586 75883120	S12
561 75726925	S06	587 75883121	S12
546 75731302	S04	499 75883128	S05
549 75738402	S06	499 75883128	S04
549 75738402	S06	635 75883150	S11
559 75738480	S06	669 75883165	S10
559 75738480	S06	630 75883180	S10
510 75745200	S04	309 75883185	S03
550 75772500	S06	683 75883196	S08
530 75774732	S05	529 75883215	S11
531 75774736	S05	529 75883215	S05
547 75806502	S08	524 75883240	S05
547 75806502	S07	589 75883312	S12
577 75810701	S07	533 75883330	S10
578 75810703	S07	533 75883330	S04
595 75880531	S11	470 75883335	S08
647 75880751	S08	470 75883335	S03
509 75881275	S05	471 75883336	S13
638 75881280	S11	471 75883336	S03
584 75881287	S12	658 75883338	S07
508 75881326	S05	594 75883360	S11
651 75881363	S08	511 75888165	S04
652 75881364	S08	521 75888570	S04
621 75881365	S08	516 75888590	S04
621 75881365	S10	517 75888591	S04
581 75881441	S12	518 75888595	S04
581 75881563	S12	570 75888600	S07
646 75881575	S12	612 75888607	S09
415 75881578	S03	613 75888610	S09
502 75881591	S04	601 75888650	S09
686 75881607	S13	506 75888675	S04
614 75881710	S09	661 75888696	S10
610 75881715	S09	597 75888785	S11
582 75881785	S12	596 75888790	S11
633 75881825	S11	648 75889215	S08
611 75881892	S09	617 75889295	S08
604 75881895	S09	617 75889295	S10
579 75881932	S12	592 75889356	S11
641 75882015	S11	593 75889366	S11
615 75882016	S09	532 75889396	S12
615 75882016	S09	532 75889396	S05
605 75882017	S09	401 75889426	S09
583 75882026	S12	401 75889426	S03
571 75882035	S07	410 75889601	S03
441 75882036	S08	414 75889628	S03
441 75882036	S03	420 75889701	S03
440 75882037	S08	423 75889728	S03
440 75882037	S03	460 75889979	S08
602 75882038	S09	460 75889979	S03
573 75882107	S07	519 75890210	S04
507 75882136	S09	520 75890211	S04
507 75882136	S04	643 75890856	S12
619 75882145	S10	503 75892007	S12
588 75882150	S12	503 75892007	S05
623 75882170	S10	639 75892888	S11
684 75882177	S10	659 75893269	S12
684 75882177	S05	644 75893550	S12
450 75882185	S08	472 75894197	S13
450 75882185	S03	472 75894197	S03
628 75882327	S10	563 75896006	S06
568 75882330	S07	302 75896102	S05
525 75882331	S07	302 75896102	S04
557 75882332	S07	302 75896102	S03
576 75882335	S07	303 75896103	S03
555 75882341	S06	303 75896103	S05

9.1 INTRODUCTION

The following paragraphs contain the following wire lists: Upper-Harness Assembly; Lower-Harness Assembly; Stepper Motor; DC Harness; Sensor Assembly Track 43; Door-Lock-Solenoid Activity LED and Head Assemblies.

9.2 UPPER-HARNESS ASSEMBLY

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length, Inches</u>
Violet	S/S Index Anode	J5-6	15 (381 mm)
Gray	D/S Index Cathode	J5-4	15 (381 mm)
Brown	Contact Door Switch	J5-1	15 (381 mm)
Yellow	N/O Door Switch	J5-2	15 (381 mm)
Orange	Head-Load Solenoid+	J5-3	9 (229 mm)
Black	Head-Load Solenoid-	J5-5	9 (229 mm)
Green	Write-Protect Anode	J5-11	9 (229 mm)
Red	Write-Protect Collector	J5-12	9 (229 mm)
Blue	Write-Protect Emitter	J5-7	9 (229 mm)
White	Write-Protect Cathod	J5-8	9 (229 mm)

9.3 LOWER-HARNESS ASSEMBLY

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length, Inches</u>
Yellow	D/S Index Collector	J6-9	13 (330 mm)
Brown	D/S Index Emitter	J6-9	13 (330 mm)
Orange	S/S Index Collector	J6-5	13 (330 mm)
Black	S/S Index Emitter	J6-10	13 (330 mm)
Green	Anode Track 0	J6-4	9 (229 mm)
White	Cathode Track 0	J6-1	9 (229 mm)
Blue	Emitter Track 0	J6-2	9 (229 mm)
Red	Collector Track 0	J6-3	9 (229 mm)

9.4 STEPPER MOTOR

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length, Inches</u>
Red/White	Ø A	J3-5	12 (305 mm)
Green/White	Ø B	J3-8	12 (305 mm)
Red	Ø D	J3-10	12 (305 mm)
Green	Ø C	J3-9	12 (305 mm)
Black	Motor Com (Ø A & Ø D)	J3-7	12 (305 mm)
White	Motor Com (Ø B & Ø C)	J3-6	12 (305 mm)
Orange	+R1	J3-3	21 (533 mm)
Yellow	-R1	J3-4	21 (533 mm)
Blue	R1 (Center Tap)	J3-2	20 (508 mm)

9.5 DC HARNESS

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length, Inches</u>
Red	J4-02, +5V	J9-5	8 (203.2 mm)
Black	J4-03, GND	J9-6	8 (203.2 mm)
Orange	J4-04, +24V	J9-1	8 (203.2 mm)
Brown	J4-06, +2V Return	J9-2	8 (203.2 mm)

9.6 SENSOR ASSEMBLY TRACK 43

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length, Inches</u>
Red	Current-Switch Collector	J8-2	7.3 (185.4 mm)
White	Current-Switch Cathode	J8-4	7.3 (185.4 mm)
Blue	Current-Switch Emitter	J8-3	7.3 (185.4 mm)
Green	Current-Switch Anode	J8-1	7.3 (185.4 mm)

9.7 DOOR-LOCK-SOLENOID ACTIVITY LED

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>	<u>Approximate Length, Inches</u>
Red	DoorLock Solenoid+	J7-1	9 (229 mm)
Black	Door-Lock Solenoid-	J7-4	9 (229 mm)
Brown	Activity LED Anode	J7-2	9 (229 mm)
Blue	Activity LED Cathode	J7-3	9 (229 mm)

9.8 HEAD ASSEMBLIES

Head 0

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>
Black	Read/Write	J2-1
White	Read/Write	J2-2
White (large wire)	Shield	J2-3
Green	Erase+	J2-4
Red	Center Tap	J2-5
-	Key	J2-6
Yellow	Erase-	J2-7

Head 1

<u>Wire Color</u>	<u>Origin</u>	<u>Destination</u>
Black	Read/Write	J2-8
White	Read/Write	J2-9
Red	Center Tap	J2-10
Green	Erase+	J2-11
White (large wire)	Shield	J2-12
-	Key	J2-13
Yellow	Erase-	J2-14

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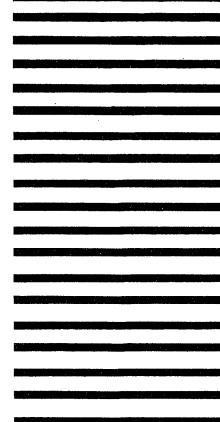
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